

UC-NRLF



\$B 271 478

Y13 1036



Geo B. Lifford  
March 3<sup>rd</sup> 1907  
Innington - W. Thurston  
1.21

George. E. Lifford  
March. 1<sup>th</sup> / 885  
No 139 West-21 St.

Dr. Lifford



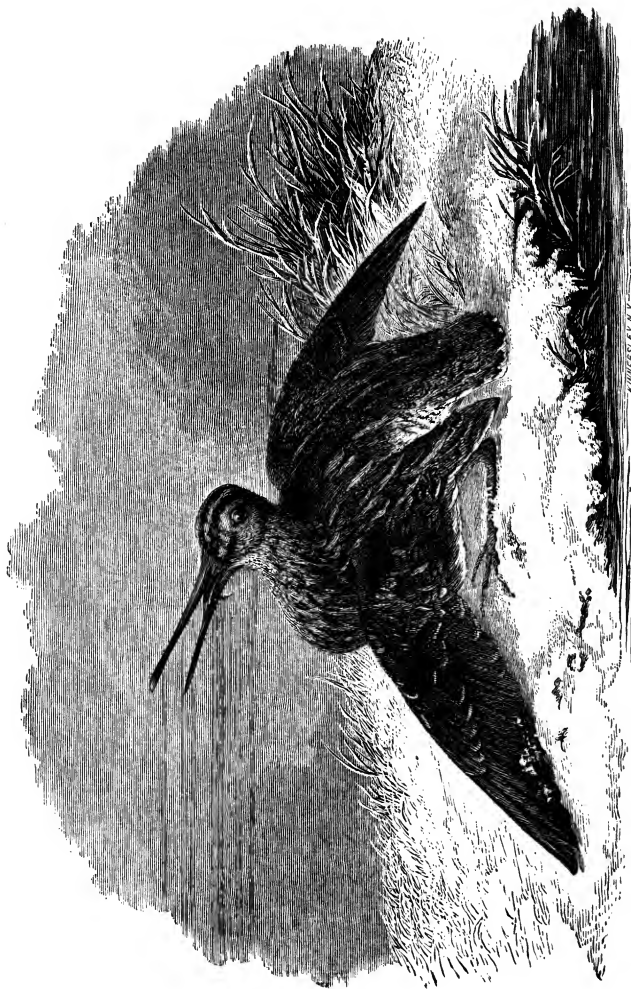
THE LIBRARY  
OF  
THE UNIVERSITY  
OF CALIFORNIA

PRESENTED BY  
PROF. CHARLES A. KOFOID AND  
MRS. PRUDENCE W. KOFOID



Digitized by the Internet Archive  
in 2007 with funding from  
Microsoft Corporation





W. W. W. W.

THE WOUNDED SNIPE.



# PLAIN DIRECTIONS

FOR ACQUIRING THE ART OF

## SHOOTING ON THE WING.

WITH USEFUL HINTS CONCERNING ALL THAT RELATES  
TO GUNS AND SHOOTING, AND PARTICULARLY  
IN REGARD TO THE ART OF

LOADING SO AS TO KILL.

*TO WHICH HAS BEEN ADDED SEVERAL VALUABLE AND  
HITHERTO SECRET RECIPES, OF GREAT PRACTICAL  
IMPORTANCE TO THE SPORTSMAN.*

BY  
AN OLD GAMEKEEPER.



NEW YORK:  
THE INDUSTRIAL PUBLICATION COMPANY,  
176 BROADWAY.  
1873.

*u*  
*Short*

**Copyright Secured.**

SK29  
75

## PREFACE.

---

THE fact that he who would preserve "a sound mind in a healthy body" must devote some time to the sports of the field, has now become very generally recognized: so much so, indeed, that "muscular Christianity" now commands the respect of the community; and boating, skating, riding, fishing, and shooting are no longer regarded as the occupations of those alone who are unable or unwilling to engage in what some are pleased to term more useful employments. It is not many years since the general feeling in this country was so opposed to the practice of shooting, except perhaps by boys or pioneers, that for a business man to be seen with a gun in his hand and a pointer at his heels, was to be ostracised by all so-called respectable persons. Fortunately, that day has gone by. Very many of our most estimable citizens, and not a few of our most able and worthy divines, enjoy the gun and the rod with a zest that proves that the highest civilization is not incompatible with the enjoyment of field sports. Such a state of things has long prevailed among our cousins on the other side of the water, where the gentleman that is unable to ride across country or bring down his partridge or pheasant as it tops the stubble or the copse, is looked upon with a feeling akin to pity. Sir Walter Scott, whose knowledge of human nature has been seldom equalled and never surpassed, tells us that in his day most English gentlemen of less than twenty years old, would feel an imputation on their horsemanship more keenly than they would one on their moral character; and few men, who were familiar with the state of society in Scott's day, will doubt the assertion. As a consequence of this feeling, every young lad whose circumstances warranted it, was taught to hunt, shoot, and fish, as regularly as he was taught to read and write. Nor was this part of his education left to such chance instruction as he could pick up among his companions, as is unfortunately the case with us. Instruction in horsemanship

ship was obtained regularly, either from a riding-master or from the groom, and part of the duties of every gamekeeper consisted in teaching the rising generation how to shoot. As a consequence, the young gentlemen of Great Britain not only became familiar with these things from their boyhood, but they learned them in such a thorough and scientific manner that they not only acquired great skill but passed through this period of their curriculum without serious danger to themselves or others. In this country we have no gamekeepers, and few grooms; and our young men are, in almost every instance, self-taught so far as all that relates to the use of the gun is concerned. More than this, the most dangerous and foolish course is in general pursued toward the lad who shows an inclination to use the gun, particularly if his guardian be not himself a sportsman. When a boy first asks permission to use a gun, it will be found that most old women (whether they wear petticoats or not) forbid the use of what they consider such a dangerous weapon, but are willing that he should have a *pistol*,—which is a far more dangerous plaything, both for the boy himself and for those who are about him. The long barrel of a gun is not readily pointed either in the direction of ourselves or others, without our knowing it; while the shorter pistol frequently comes into dangerous range either of the person who holds it or of others, without being immediately perceived. Moreover, a boy in such circumstances receives no proper instruction in the handling, loading, carrying, and discharging of a gun, when by his own stealth or the carelessness of his guardians he comes into possession of one. Those rules which, from long habit, have become second nature to all good sportsmen, are unknown to him, and of course unacted upon. He carries his gun with the hammers on the caps, and with the muzzle pointing downward or horizontally toward every point of the compass. He pokes the muzzle through any fence he may have to cross, gets through or over himself as best he can, and then drags the gun after him, frequently receiving the contents of one of the barrels while so doing. In short, his gun, instead of being an instrument of honest recreation, becomes the source of stolen sprees, and is sooner or later a cause of serious accident. Sensible guardians ought to abandon all this. If a young man shows an inclination for the sports of the field, let them see that he is provided with a safe and efficient weapon, and carefully instructed in its use. Youth must have recreation and it is better for a young man that he should devote his days to the green fields than his nights to the green table.

When field sports are recommended to the sedentary for exercise, we often hear ultra utilitarians inquire why wood-sawing, digging, and other useful employments, are not quite as good a means of exercise as shooting, fishing, riding, etc. The answer is obvious enough, though perhaps not always appreciated by the narrow-minded ignorance that characterizes the group to which such persons belong. Physiologists know well enough that the evils which arise from sedentary employments are caused in a great measure by the unequal strain that is placed on one set of powers. The mind is kept in a state of high tension, while the physical man is allowed to relax to the utmost. Now, if we would remedy this state of things, it is evident that the mind must be relieved by being diverted from the subjects that have previously engrossed it. This can not be done by such purely mechanical operations as digging, sawing, etc. If a mathematician should resort to digging for exercise, the chances are ten to one that while his hands and feet were engaged in physical exercise, his brain would be intensely occupied with problems in the higher calculus. If, however, he should take a gun, and wander through the woods and fields in search of game, his attention would be constantly occupied, and the strain upon his nervous system would be relieved.

Shooting is an art that any active young man with good eyes and nimble fingers may soon learn, provided he sets the right way to work. Of course, if instruction can be obtained from some experienced and intelligent sportsman, it will be better than any amount of reading. It unfortunately happens, however, that many very excellent shots are utterly unable to give the tyro anything like proper instruction; they can kill their own birds, but they can not instruct their young friends how to do it. Beside this, many young men who own guns and are extremely fond of using them, have no one who is competent to instruct them. They therefore confine themselves to sitting shots, or easy flights; they hunt squirrels, shoot pigeons off the tree, single ducks off the water, and are even guilty of stalking the covey of partridge and pouring in the death-dealing shower when the poor birds are huddled together. Such gunners never feel the joy which thrills through the nerves of every sportsman as he brings down the strong-winged mallard as he clears the rushes, or stops the woodcock as with ringing flight he darts through the copse, or tumbles over the wild pigeon in its most rapid flight, or cuts down the sharp-flying quail as he rises on whirring wing, or the snipe as he turns and dodges. Merely to

kill birds is the work of the butcher; with the sportsman, killing may be the end of his work, but that from which the chief joy arises is the skillful and successful search, in which reason is pitted against instinct, and then the deft and scientific shot which illustrates at once our skill and our knowledge. To show the young sportsman how to obtain the skill that will enable him to bring down his game cleverly and cleanly, after he has found it skillfully, is the chief object of the writer. We have, therefore, confined ourselves strictly to the art of shooting, and have not attempted to give directions for finding game, breaking dogs, or retrieving. Perhaps, if the present attempt should receive the favor of the young devotees of the gun, we may, in a future volume of similar size, condense the most important points relating to these matters.

When compared with many of the larger and more expensive works now before the public, it may seem that the present volume is rather a small one; but we believe that it contains nearly everything of any consequence that relates to the practice of the art. Most of the books on sporting are made large in order that the authors and publishers may reap a greater profit, and to this end the bulk is increased by endless discussions in regard to the history of sporting, from the days of Nimrod down. They can not tell us how to choose our powder without giving an account of Schwartz, Bacon, and others, to which is generally added a disquisition on the composition and mode of manufacture of powder, all which is better adapted to the use of the superintendent of a powder-mill than of a sportsman. By leaving out all this irrelevant matter, we have saved a great deal of room.

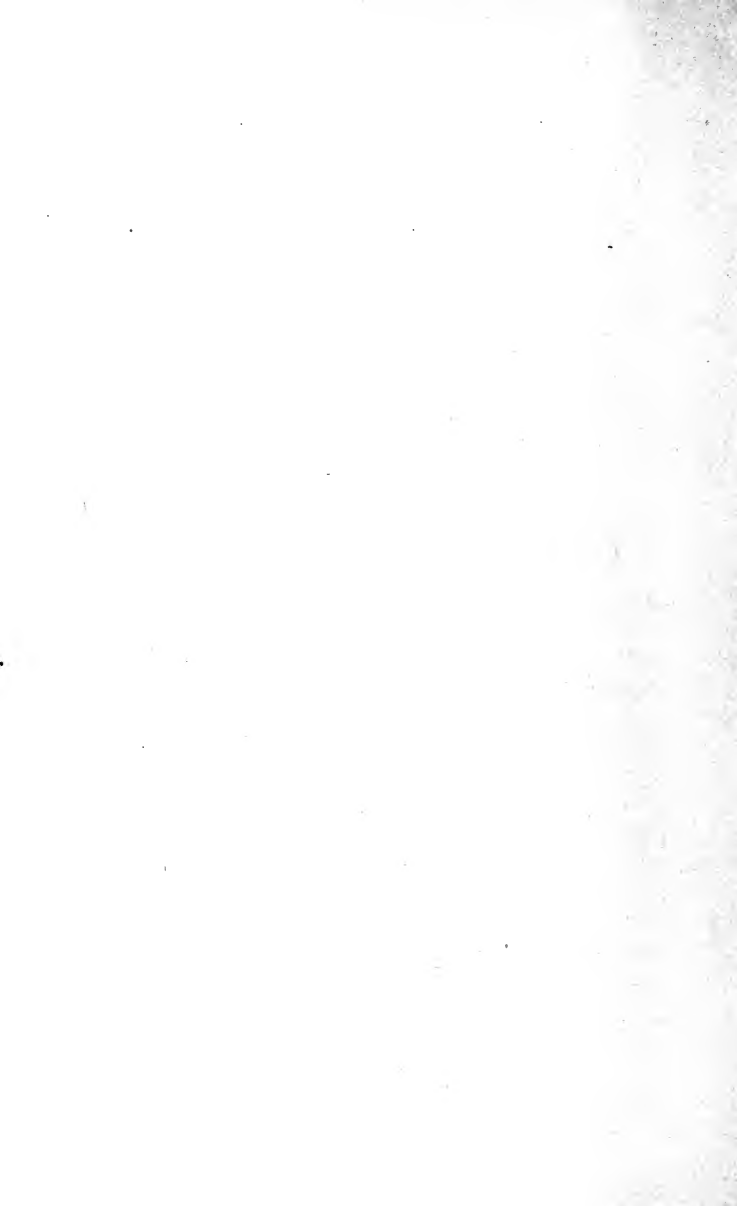
Within the last ten years breech-loaders have been brought to such a degree of perfection that they promise to supersede entirely the old muzzle-loader. Although we own several first-class muzzle-loaders we seldom use them, preferring the breech-loader altogether. This makes little difference, however, so far as the young sportsman is concerned: the same rules that apply to the one apply to the other, and he who can successfully use a muzzle-loader will find no difficulty in managing a breech-loader.

THE ALDERS, *March*, 1873.

## CONTENTS.

---

How to Choose the Gun. . . . .	9
Weight.—Gauge.—Length of Barrels.—Materials and Finish of the Gun.—Freeing, and Close Shooting.—Engraving and Browning.—Shape of the Barrels.—The Stock.—The Triggers.—Nipples and Vents.	
BREECH-LOADERS AND MUZZLE-LOADERS. . . . .	24
AMMUNITION, ACCOUTREMENTS, AND IMPLEMENTS. . . . .	27
Powder.—Shot.—Caps.—Wads.—Powder-Flask.—Shot-Pouch.—Cap-Chargers.—Gun-Cases and their Accompaniments.	
How to Load the Gun. . . . .	36
How to Clean the Gun. . . . .	50
How to Carry and Handle the Gun. . . . .	56
How to Learn to Shoot. . . . .	59
FINISHING TOUCHES. . . . .	70
USEFUL HINTS. . . . .	75
RECIPES AND MISCELLANEOUS MATTERS. . . . .	78





# THE ART OF SHOOTING ON THE WING.

---

## HOW TO CHOOSE THE GUN.

WHETHER we select a high-priced or a low-priced gun, a muzzle-loader or a breech-loader, there are certain points which must not by any means be ignored if we would achieve decided success in its use. It is true that some men seem to be able to shoot with any kind of a weapon, whether it be an old flint-lock musket, a heavy ducking gun, or an awkward, top-heavy, pot-metal piece. But if the reader finds that he can bring down his game with any kind of a gun, then this little book is not intended for his use. Many men, however, find it as difficult to shoot with a gun that does not suit them as to walk with a pair of ill-fitted boots; and unless the young sportsman has a wonderful genius for the art, he will find it absolutely necessary to provide himself with a gun that is adapted to his own bodily conformation as accurately as the coat that he wears. Some of the most skillful gun-makers even go so far as to say that every gun ought to be made specially for the person who is to use it, and they actually measure their customers just as a tailor measures those for whom he makes coats. We think, however, that this is hardly necessary, and that a very good fit may in general be

obtained out of the stock of any of our respectable gun-makers. The points which require most careful attention are the following :—

**Weight.**—Most young sportsmen are apt to overload themselves, and to procure a gun that is by far too heavy for the man that is to carry it. No greater mistake can be committed, for nothing is so apt to destroy one's ability to shoot well as the fatigue arising from being fagged out by carrying a fowling-piece that is too heavy for the strength of the bearer. It is true that a heavy gun will shoot stronger and carry a heavier charge than a light one, and by so much as it does so by so much are our chances for bagging game increased, *provided we are able to handle the heavy gun efficiently*. But if we watch ourselves or our companions toward the close of a hard day's shooting, we will find that the heavy gun is brought up slowly, and that the game flies several yards farther before being shot at, than is the case with a light gun. Now the great secret of success in shooting on the wing, at fair distances, lies in firing before our birds have got under full headway. Not only is the distance shortened in this way, but the bird presents an easier mark. The partridge or grouse, when he first rises from the ground, hangs in the air, making a great show of feathers and flapping, it is true, but still moving with comparatively great slowness; and if we can throw our gun to the shoulder, cover our object, and fire during these preliminary movements, the game is pretty certain to come to bag. But should the slowness of our movements delay the act of firing for a single second, the case becomes very different. A vigorous grouse in full flight moves at the rate of nearly one mile a minute,\*

---

\* Wild ducks have been found to fly ninety miles per hour, or a mile and a half per minute, by actual measurement.

or thirty yards per second. During a single beat of our pulse he will have put an additional twenty yards between himself and the gun, and this may be enough to overtax the heaviest and hardest-shooting weapon. Therefore, let the young sportsman select a gun that is *under* rather than over weight, and endeavor to make up for its deficiencies by the greater rapidity and expertness with which it is handled.

We would not by this, however, have the tyro suppose that all game must be fired at the moment it is on the wing. To adopt such a system, and practice it continually, would be to ruin more than half the birds shot at; but the ability to use the gun in this way is essential to the character of a good shot, and if we are, on occasion, prevented from so doing by the weight of the gun, it shows that the weapon is too heavy.

Fortunately, however, the sportsman that selects a light gun does not make a sacrifice which is anything like in proportion to the diminution of weight. The hardest-shooting and most effective gun that we ever owned weighed only six and a half pounds, and number twelve gauge at that. And one of our friends was so thoroughly convinced of the trifling advantage that is secured by great weight that he fitted up a large horse-pistol with a skeleton stock, and with this little weapon, which weighs less than three pounds, he kills most of his woodcock. The barrel, however, is of very superior material, and has been carefully bored, so that it does wonderful execution. Its owner at one time expressed a willingness to accept a challenge from any gun, provided he was allowed two yards for every pound that the competing gun exceeds his pistol.

It has been thoroughly ascertained that while the weight

of the charge which may be used is directly as the weight of the gun from which it is fired, the efficiency of any charge does not at all increase in the simple ratio of its weight. Mathematicians tell us that the efficiency of a charge is nearly as the square root of its weight. For example, a charge of four ounces of shot would not do equal execution four times as far as a charge of one ounce, but only about twice as far, while it could be projected with efficiency only from a gun of four times the weight of the small gun. Now one ounce of shot can be fired very well from a gun of four and a half to five pounds weight, while four ounces would require a gun of from sixteen to twenty pounds; and while the small gun will kill at thirty-five to forty yards, the large gun can not be expected to accomplish much at a distance of more than eighty yards. While, therefore, there is certainly some advantage to be derived from the use of heavy guns, this advantage never can overbalance the greater inconvenience which attends the greater weight. In the above example we have taken two extreme cases—a more than ordinarily light gun and a more than usually heavy one. But the principle holds quite as well in regard to guns of common size. Taking two guns, one of eight pounds and one of ten pounds, it is very obvious that the ten-pound gun will tire out a man of common strength more than twice as rapidly as will the gun of eight pounds. But the ten-pound gun will carry a charge which is only one fourth greater than that carried by the eight-pound gun, and the efficiency of these two charges will be as 2.82 to 3.16. That is to say, if the eight-pound gun can kill at forty yards the ten-pound one will kill equally well at forty-five. It is very evident, however, that this gain of five yards is no compensation for the extra fatigue incurred. Our own opinion

is that from six to nine pounds is the proper weight for a fowling-piece for ordinary game. Very few men can handle a heavier weapon than one of nine pounds, while the weakest can carry one of six. Our favorite weight is seven and a half pounds. A gun of this weight can be carried all day and thrown to the shoulder at night with rapidity and precision, and it will do good work on either snipe or duck at any distance under forty to forty-five yards.

**Gauge.**—Fifty years ago small bores and long barrels were all the rage. Barrels three feet, and even forty inches, long, and having bores as small as number twenty-two, were in common use. A few years later it was found that wider bores did much better execution, and at length the diameter was increased and the length diminished until a fashionable gun was about nine or ten bore and twenty-four to twenty-six inches long in the barrels. It was soon found, however, that these very wide bores, unless combined with proportionate weight and length, did not shoot strongly, and a reaction set in, after which the majority of the guns that were made were of sixteen and fourteen gauge,—very good gauges, but we think a trifle too small. In selecting a gauge for shot-gun barrels, we meet with difficulties in both directions: moderately large shot does not chamber well in a very small bore, and when powder is exploded in a large bore, the pressure on the shot is not great enough unless we use very heavy charges of powder, in which case the gun is apt to recoil. After many years' experience with guns of every gauge, we have come to the conclusion that for all ordinary shooting number twelve is about the best gauge that can be employed. Frank Forrester preferred number fourteen, and it must be confessed that in the smaller gauge the same weight of powder will produce a greater pressure per square inch

on the charge of shot, and consequently a greater propelling power. But, on the other hand, the same weight of shot presents a less depth in the larger bore, and consequently opposes less resistance per square inch. In addition to this, there is probably less friction on the sides.

Those who desire to examine this subject more closely will find the annexed table, which gives the size in inches of the various numbers, very convenient :—

TABLE GIVING THE SIZES OF THE VARIOUS GAUGES.

Number of Gauge.	Diameter of Bore, in inches.	Number of Gauge.	Diameter of Bore, in inches.
1.	1.669	19.	.626
2.	1.325	20.	.615
3.	1.157	21.	.605
4.	1.052	22.	.596
5.	.976	23.	.587
6.	.919	24.	.579
7.	.873	25.	.571
8.	.835	26.	.563
9.	.803	27.	.556
10.	.775	28.	.550
11.	.751	29.	.543
12.	.729	30.	.537
13.	.710	31.	.531
14.	.693	32.	.526
15.	.677	33.	.520
16.	.662	34.	.515
17.	.650	35.	.510
18.	.637	36.	.506

The values here given of the different numbers are those adopted by the British proof-houses. We may add that the number of the gauge was originally designed to express the number of balls to the pound, when the size fitted the gun. Thus a ball, of which sixteen weigh one pound, will fit tightly a gun of sixteen gauge.

On the whole, we consider that the claims of the different gauges between eleven and fourteen are pretty evenly balanced. If a gun suited us well otherwise, we would not reject it on account of the size of the bore, provided it came within these limits. Gauges larger than number ten are fit for duck-guns only.

**Length of Barrels.**—Long barrels, whether for shot-guns or rifles, are now pretty much abandoned. Barrels three and four feet long were not uncommon a few years ago, but many of them have been cut down to thirty inches, or even twenty-eight or twenty-six inches, with decided improvement to their shooting. A few years ago we came into possession of a gun, number eighteen bore and forty inches in length of barrel. It shot well, but it was almost impossible to kill game on the wing with it. We therefore subjected it to a series of experiments, cutting it off two inches at a time, and testing its shooting at every stage. In closeness there was no falling off at all, and the penetration seemed to be nearly as great, though we thought we could occasionally perceive a slight difference,—perhaps due to the diminution in the weight of the gun. When we reached twenty-six inches, however, we had the barrels carefully bored over, and polished on the inside as smoothly as possible. Up to this time we had used a very coarse powder, finding that with the forty-inch barrels it did the best work. Now, however, we began to use a powder that had a somewhat finer grain, and the result of all these improvements was that our little twenty-six inch gun, seventeen gauge (increased one size by boring) shot more closely and strongly than it did before it was shortened, while as to convenience in handling there was no comparison. The gun is now quite light (seven pounds), short and handy, and for snipe and woodcock it answers

very well, and is a favorite with most persons. We keep it for the accommodation of such sporting friends as may happen to visit us without bringing their guns, but for our own use we prefer a gun that carries a heavier charge, as in shooting at woodcock in dense brush we are often obliged to fire where we *think* the bird is, rather than where we *know* he is, and in that case a gun that sends a heavy load over a large space possesses great advantages.

Such being the general principles which ought to govern us in the adjustment of the most important individual features of the gun, it is not difficult to determine what the entire combination should be in order to adapt it to the use of the sportsman. A large and powerful man, capable of using a gun of nine pounds in weight, should select one of not less than eleven or ten bore and thirty-one or thirty-two inches length of barrel. Such a gun, if properly handled, will do killing work at any distance under fifty yards, for three and a half to four drams of powder and one and three-eighths to one and five-eighths ounces of shot, may be discharged from it without producing any sensible recoil. We have now in mind a gun of this kind, number ten bore and thirty-one inch barrels, which, for hard hitting and close shooting, is certainly unequalled by any lighter piece of which we have any knowledge, and as the owner is abundantly able to handle it, it would be folly for him to choose a less effective weapon. On the other hand, a man of feeble physique, who is easily tired, would do well to content himself with the very lightest gun that is capable of making a fair bag, and this we conceive to be about six pounds weight, fourteen to sixteen gauge, and twenty-seven to twenty-eight inches length of barrel. A gun of these dimensions is capable of doing



fair work at thirty-five to forty yards, and if care and good judgment be used in loading it, it will beat many guns of far greater weight and length. For anything under seven pounds, Frank Forrester recommends a single-barrel gun, but we can hardly agree with him. A double-barrel, such as we have just described, is by no means a mere plaything or popgun; and although it can not, of course, do the execution that longer and heavier guns are capable of, yet it is quite effective for the majority of shots at game which, as is well known, seldom exceed twenty-five yards. The only weapon that will compare with such a double-barreled gun as we have just described is a single-barrel breech-loader, and of this class of guns a very excellent model has been recently brought into market. It is light, handy, of moderate price, and excellent materials and workmanship. It can be loaded so rapidly that for many kinds of shooting it is quite as efficient as a double-barreled muzzle-loader, and for some purposes, as for wild-fowl shooting where the birds are flying in great numbers, it is greatly more efficient.

Between these extreme sizes, however, is found the most useful and pleasant gun for men of average strength, and this we believe to be seven to seven and a half pounds in weight, number twelve gauge, and twenty-eight inches length of barrel. This is the size of our own gun, and several of our friends have, after careful examination, procured guns like it, and in no instance that we know of have guns of this size, whether breech-loaders or muzzle-loaders, failed to give satisfaction, if well made. With ours we can bring down a duck with tolerable certainty at forty to forty-five yards; and, when properly loaded, it makes sure work of snipe, woodcock, quail, and grouse, at all ordinary distances.

For long shots at ducks and sea-fowl, a heavier gun is absolutely necessary. We feel confident, however, that *long* range is to be attained more by increasing the size of the shot than by increasing the quantity of powder used to propel it ; and this being the case, we recommend and use a gun of such large bore that a double barrel is impracticable. We have adopted one of number five gauge, forty-four inches length of barrel, and fourteen pounds weight, and we find it a killing weapon at single birds at eighty to ninety yards. Those who desire to use larger and heavier guns must take lessons from Col. Hawker, whose work on shooting is the standard authority in regard to all guns over sixteen pounds in weight.

**Materials and Finish of the Gun.**—Unless the sportsman is thoroughly familiar with the materials and process of manufacture of firearms, all directions based upon a description of the raw material are useless ; and if he be thoroughly familiar with the subject, such directions are superfluous. It is only by the results attained in the completed weapon that a correct judgment can be formed by any one who is not a professional gunmaker, and a few hours spent in examining guns in the shop of a respectable dealer or maker, will do more to enable the novice to determine whether a gun is laminated steel, stub and twist, or plain iron, than weeks spent in studying books. Upon one thing the purchaser may rely, however : a really good gun can not be obtained for a trifle. He who would purchase a first-class gun must pay a first-class price ; and when, as is frequently done, a new gun is offered for anything less than fifty dollars, and is claimed to be first-class, it will be well for the intending purchaser to remember that even the raw material of such a gun is worth more than the price asked for the finished article.

Guns are sold at all prices, and of all qualities. The New York wholesale market is flooded with double-barrel guns of the most worthless character, which are sold for from five to ten dollars each, and are known as *pot-metal* guns. It needs but a glance to detect their character, and yet these cheap guns are frequently bought by country gunsmiths, who overhaul them a little, polish the interior of the barrels, *especially toward the muzzle*, smooth off and perhaps case-harden the locks, and then offer them to country gunners at prices varying from fifteen to twenty-five dollars. Let no man who values his life ever procure one of these miserable abortions. That no one would knowingly do so we feel confident, but when furbished up and recommended by a gunsmith as a good cheap gun, the verdant shooter is liable to be misled into buying one. They may be easily detected by a certain profusion of varnish on the barrels as well as on the stock; by the rough manner in which the various parts are fitted together, and especially by the fitting of the locks and by the coarse and grating movement of the latter. For, after all, the best and safest index to the quality of a gun is to be found in the locks; if these work with a certain oily smoothness, which is indescribable but easily recognized, the entire gun may be safely pronounced of good quality. The young sportsman will do well then to examine carefully some really good gun: observe the smoothness with which the hammer glides back under the pressure of the thumb; the force with which the hammer is pressed against the nipples—a force nearly as great as that exerted when the hammer is at full cock; notice the sharp and clear click with which the sear springs to its place; and watch the lightning-like sharpness with which the hammers are driven down to the nipples. One who has handled a

really good gun and observed these points, can hardly be deceived in regard to the quality of the locks, and this, as we before observed, is a sure index to the quality of the entire piece.

The interior of the barrels should be very smoothly finished. This we regard as a very important point, though it is one that is but too often neglected in all but the very highest-priced guns. The object of this high finish is to lessen the friction, and, as a consequence, to increase the force and closeness of the shot. The force is increased from two causes: less resistance is offered to the passage of the shot, and on this account we can use more powder without causing the gun to scatter too much. The closeness is increased, because, since the forward layers of shot move along the barrel easily, they do not receive as much pressure from the rear layers, and neither layers are so apt to be bruised and distorted. In addition to all this, smooth barrels keep clean longer, and are more easily cleaned when the work is done. It is this feature that confers upon laminated steel barrels one of their most valuable qualities. A good steel barrel is not easily corroded, it does not foul readily, and its strength is unquestionably greater than that of barrels made of other materials. In the days of Frank Forrester steel barrels were regarded with a good deal of suspicion, but at the present day they occupy, and justly we think, the very first rank.

**Freeing.**—To increase the closeness with which the gun throws its shot, it is usual for gunsmiths to enlarge the diameter of the barrels for about one third of their length next the muzzle. This is technically called *freeing*, and all good guns are fixed in this way. Too much freeing, however, is as bad as too little. Any approach to what is known as a “bell-mouth” will cause the gun to scatter.

**Engraving and Browning.**—It is hardly necessary to caution the reader against a gun that is profusely ornamented (?) with cheap and coarse engraving. Such work merely increases the expense without adding to the value, and as it forms a first-rate nucleus for dirt and rust, which will in time destroy or greatly injure the weapon, it should be carefully avoided. At the same time, do not neglect to assure yourself that the barrels are well browned. Besides adding greatly to the appearance of the gun, good browning is a wonderful preventive of rust. It requires a skilled workman to brown a gun well, however good may be the recipe that he may use. For the convenience of such of our readers as may desire to experiment upon this subject themselves, we give some very excellent recipes at the end of the volume.

**Shape of the Barrels.**—One of the greatest faults that can exist in any gun is to be top-heavy. Such a gun comes up slowly to the mark, and is very fatiguing in the field. One reason why cheap guns are always top-heavy, is that the material of which they are made is of poor quality, and consequently the manufacturers dare not make them thin toward the muzzle. With good stub and twist or laminated steel, the barrels may be made almost as thin as paper toward the muzzle, and yet be perfectly safe. But all barrels ought to be heavy at the breech, as in this way the gun not only balances better but is rendered much more capable of withstanding heavy charges. This feature has been carried out more fully during the last few years than ever before, but that it is not a new idea, the following extract from the writings of Edward Davies, who flourished about the beginning of the seventeenth century (1619) will show:—

“He that loves the safetie of his own person, and de-

lighteth in the goodness and beautie of a piece, let him always make choice of one that is double-breeched; and, if possible, a Mylan piece, for they be of tough and perfect temper, light, square and bigge of breech, and very strong where the powder doth lie, and where the violent force of the fire doth consist, and notwithstanding thinne at the end. Our Englishe pieces approach very neare unto them in beautie and goodness (their heaviness only excepted), so that they be made of purpose, and not one of those common sale pieces with round barrells, whereunto a beaten souldier will have great respect, and choose rather to pay double money for a good piece, than to spare his money and endanger himself."

**The Stock.**—The stocks of almost all sporting guns are made of black walnut, which is now generally finished in oil,—a style which is greatly to be preferred to varnish, as being less liable to be scratched and marred. The shape and length of the stock will exercise an important influence on the ease with which the shooter will handle his weapon, and these features must, as we have elsewhere noted, be accurately adjusted to the length of the shooter's arm and neck.

**The Triggers.**—We have seen many guns, otherwise of excellent quality, rendered almost unusable, owing to the great force necessary to pull the trigger. A trigger that pulls too easily is dangerous; one that pulls too hard deranges the aim, and is fatal to quick shooting. Fortunately, the gunsmith can easily regulate this point. See therefore that the triggers pull with a degree of force that is adapted to your personal requirements, and also see that both triggers are made to go alike.

**Nipples and Vents.**—The rapidity and certainty with which the gun is discharged depends very much upon

the shape and material of the nipple or cone. Greener makes the following very judicious remarks upon this point: "The nipples now in general use have the smaller orifice at the bottom, and, being lined with platina, never foul. Experience has shown that admitting the gunpowder into the nipple is not advantageous, especially with large-grained powder; by constructing the nipple with the small orifice at the bottom, the largest grain can be used beneficially. As the velocity of the fulminating gas is much greater than 'a train' of gunpowder ever can be, quickness is also gained by their adoption. I have used them for many years with great success; nothing but cost deters their general adoption."

When the percussion was first substituted for the old flint-lock, it was found that it was not as pleasant a shooting weapon as the older form. Under the mistaken idea that it would lessen the recoil, a vent was made in the barrel, just like the vent of a flint-lock gun, but smaller. It was then supposed that the percussion had been made so nearly like the flint-lock that it could not fail to equal it. Now, while it is certain that the vent does not lessen the recoil, it is equally certain that it greatly increases the certainty and rapidity of the ignition of the charge, and it does it in this way: The great obstacle to the entrance of the fire from the percussion cap is the air contained in the gun, among the grains of powder. Under ordinary circumstances, you might as well try to fill a bottle with water without letting out the air, as to force the flame of a percussion cap into an air-tight barrel. The vent, however, allows a small portion of the air to escape; this permits the entrance and diffusion of the flame from the cap, and the charge becomes thoroughly ignited.

**BREECH-LOADERS AND MUZZLE-LOADERS.**

A decade has scarcely passed since breech-loaders of every description were condemned *in toto* by all gunsmiths and sportsmen of reputation and experience. Now, however, the tide has turned in their favor: the best makers have undertaken the manufacture of this class of guns, and it is safe to predict that ere another decade has passed away, muzzle-loaders will be things of the past. Looking back, even from our present standpoint, it is amusing to note the positiveness with which all the best writers declared against the breech-loader. Frank Forrester, for example, alluding to Stonehenge's description of the Lefauchaux gun, pours out the bitterest ridicule against all breech-loaders, and especially against this one. He regards it as inefficient in practice, and worthless if it were efficient. He finds fault with it because it has no nipples, and because special cartridges are required, and concludes that an active man could charge a muzzle-loader, with flask and shot-pouch, as quickly as the breech-loader could be charged with its cartridges. All this seems very ridiculous to us now, and yet Herbert (Frank Forrester) was a man of good judgment in the matter of guns.

Nor did Herbert stand alone in this matter. Greener, in his work entitled "Gunnery in 1858," devoted a whole chapter to the abuse of the breech-loader. Just hear how he rails at them, *especially because the invention originated in France*: "The French system of breech-loading firearms is a specious pretence, the supposed advantages of which have been loudly boasted of; but none of these advantages have as yet been established by its most strenuous advocates. How it is that the British sportsman has become



the dupe of certain men who set themselves up for respectable gun-makers, I know not. With regard to the safety of these guns they display an utter want of the most ordinary judgment," etc., etc. Again: "There is no possibility of a breech-loader ever shooting equal to a well-constructed muzzle-loader; secondly, the gun is unsafe, and becomes more and more unsafe from the first time it is used; and, thirdly, it is a very costly affair, both as regards the gun and ammunition. Nor are these negative qualities at all compensated for by any of the advantages claimed for these guns by their advocates." Further on he says: "It is said, and said truly, that a breech-loader can be charged more rapidly than a muzzle-loader; but I hold this to be no advantage, for this reason—all guns can be loaded more quickly than they are fired, and the tendency of all guns to absorb heat, puts a limit to rapidity of firing. There are few plans, or presumed improvements, which have not some redeeming points; but in the case of breech-loading firearms, it is quite a task to find even a resemblance to one. No fear need be entertained that the use of breech-loaders will become general." This was written in 1858; now (1873) Mr. Greener, or at least his son, manufactures a very excellent double-barrel breech-loading shot-gun.

The advantages of the breech-loader are very great and important. First of all, it can be loaded in one tenth of the time that a muzzle-loader can be charged, and this, where wild fowl are flying thickly and for but a short time, as toward evening, is a very important matter. Moreover, if the sportsman should chance to be out in search of one kind of game and should happen to find game of a different kind, the charge can be changed in a twinkling. Thus, if out shooting ducks, and a flock of geese should come

in sight, the charge can be changed before they come into shooting distance. We have often, when in pursuit of ducks, had our dogs come to a point on snipe, in which case it did not occupy a longer time to change the load, walk up the bird and bag him, than would have been required to simply draw a charge from a muzzle-loader.

It is said that the breech-loader is safer than its competitor, and probably it is, though either of them are safe enough in the hands of a careful man, and no gun is safe when used by the ignorant or reckless. But it is in the matter of cleaning that the breech-loader possesses a decided advantage over the muzzle-loader. After an ordinary day's shooting the latter requires a good hour's hard labor before it can be pronounced fit to be laid aside, while the breech-loader can easily be cleaned in ten minutes, and the labor is comparatively easy.

In the early days of the breech-loader, it did not shoot either as strongly or as closely as the muzzle-loader. This was to be anticipated. It could not be expected that a new gun, just invented and barely brought into working shape, should compete with a form upon which the best talent of a century had been expended. There were perhaps two hundred breech-loaders in existence, and these were pitted against a few guns picked out of two hundred thousand, by the best makers. Even as far back as the days of "The Field" trial, in 1859, the breech-loader was ahead of all second-rate muzzle-loaders; and when we say *second-rate*, we refer to the bulk of all the highest-priced guns in use. To-day the breech-loader is neck-and-neck with the muzzle-loader. That it will ever beat the older form we very much doubt. That breech-loading rifles *excel* muzzle-loaders is well known, and it is easy to see why they do so. But we can not see any reason why

either breech-loading or muzzle-loading shot-guns should excel, and we therefore believe that so far as shooting qualities are concerned, they will prove equal. Thus far, the breech-loader seems to demand more powder than the muzzle-loader. This, however, is not a serious objection. Most persons believe that it arises from the fact that the muzzle-loader has a better-shaped chamber than the breech-loader, and we confess to a suspicion that this idea is not altogether unfounded. Stonehenge says, that, after careful trials he could not find that breeching made any difference. Greener claims very earnestly that a properly formed breech adds largely to the shooting powers of a gun. From experiments which we ourselves have made by forming a temporary breech in a steel cartridge, we feel convinced that the application of a well-formed breech will add greatly to the shooting power of a gun. To adapt proper chambers to our cartridges, however, would make them altogether too heavy, and we must therefore rest content for the present to increase the quantity of powder by a small percentage.

We consider that it would be premature, in these days of rapid improvement, to recommend any particular breech-loader above others. We therefore refer our readers to the advertisements which may be found in most journals that go into the hands of lovers of the gun. The address of one or two reliable makers will be found appended to the present volume.

#### AMMUNITION, ACCOUTREMENTS, AND IMPLEMENTS.

Good ammunition and accoutrements are as essential to safety and good shooting as is a good gun. Bad powder will destroy the shooting of the best fowling-piece, and a

poor powder-flask is almost as dangerous as worthless locks or imperfect barrels. A few hints on the selection of these articles will therefore prove of value to the novice.

**Powder.**—With the history of the discovery of gunpowder and its chemical composition, the sportsman has little to do, while whatever enables him to select a really good article, and to preserve it after he has got it, is of the utmost importance. There are a few rules to be observed in the selection of powder, though, after all, the only sure way is to try it in the gun, and when we find a really good article, lay in a supply sufficient for the season. Good powder should be hard in the grain, and made from materials that have been not only thoroughly mixed but powerfully compressed after being made into cake. Poor powder, when rubbed in the hand, soils the skin, not because it is dirty but because it is easily abraded, or rubbed into dust. Such powder never preserves its grain well, and when a charge of it is kept in a gun or in a cartridge, it is apt to cake and hang fire. Moreover, powder of such loose texture is peculiarly liable to receive injury from dampness or moisture. When the materials have not been well mixed—and by this is meant a somewhat more thorough operation than merely stirring them together like so much porridge—the particles of sulphur and charcoal do not readily find their appropriate particles of nitre, and some of the nitre and some of the charcoal and sulphur remain uncombined after the explosion. In addition to this, unless the incorporating process has been very thoroughly performed, the proportions of these different ingredients, which may have been precisely accurate in the charge that was thrown into the mill, may not be just right in each individual grain; and, in this case, the powder

will leave a large residuum. Again, if the powder be exposed to dampness, the nitre is apt to crystallize and separate from the charcoal and sulphur, and the powder not only shoots weakly but fouls the gun badly. A guide to the quality of powder may be found in these tests: 1. Rub it in the palm of the hand, and if it soils the skin to any considerable extent, or if the grain breaks down, reject it. We have on hand some large-grained ducking-powder, of American manufacture, of which the grains are so hard that they can not be broken up except with great difficulty; and this powder not only shoots strongly, but leaves the gun in good condition. 2. Fire a regular charge of powder and shot at several sheets of paper, just as if you were trying the quality of the gun, and observe the force with which it throws the charge. Remember, however, that in comparing powder of different sizes of grain, you must be careful to use equal weights. A given measure filled with large-grained powder will not contain as much as the same measure filled with powder of fine grain. After half a dozen shots have been fired, examine the gun and see if it be very foul. Examine also the character of the residuum. Some powder leaves a dry residuum that is very destructive to the gun on firing the subsequent charges. This is especially the case as regards breech-loaders. The gun, if a muzzle-loader, after standing uncharged, should be moist instead of dry. The residuum from some powder is so soft and lubricous that it does not interfere at all with shooting. 3. Observe the recoil. The *total* recoil is probably always the same in the same gun when the shot is thrown with equal force. But the pressure opposed by the shoulder being a constant quantity of about ten pounds, it makes a great difference whether a recoil of seventy pounds is imparted in the

1-500th or the 1-200th of a second. In the first place, a severe contusion might be the result, while in the latter the recoil might be quite endurable. Other things being equal, a slow-shooting powder gives more force and less perceptible recoil than a quick-shooting article; and, as the coarse-grained powder is always, *cæteris paribus*, slower than the fine grain, those who require to use heavy charges always employ coarse-grained powder.

As few persons care to keep more than a flaskful of powder in the house, it is a matter of importance that proper means should be taken to keep the main supplies in good condition, even though deposited in a barn or out-house. Bottles, well dried and warmed, may be filled with powder, well corked, and sealed with a mixture of equal parts of lard and resin. This mixture is so soft and adhesive that it may be applied to the bottle without the use of a greater heat than can be obtained from boiling water. The best plan is to dry the bottles carefully, warm them thoroughly, and then fill them with the powder at a distance from any fire. Cork them tightly, and dip the corked necks in the composition we have described, which may be kept hot in a small tin pan. Nearly as good results may be obtained by the use of the ordinary tin canisters, which are closed with a screw cap. A greased leather washer must, however, be placed between the cap and the shoulder of the hole or neck. The object of all this is to make the vessel perfectly air-tight. If it be not air-tight, then, as the contained air expands and contracts, it will be expelled and drawn in, and will infallibly draw in moisture with it.

**Shot.**—The time was when all shot was home-made, and consisted of sheet-lead cut up into little cubes by means of a knife. Those who have read the sporting

literature of the last century must remember the discussion which ensued between the advocates of the patent drop-shot and the old form. Now, however, all the shot that is used is drop-shot. Good shot is perfectly round, and of great evenness in the grain. It should be very smooth, and well polished with a very thin coating of black lead or plumbago. This is called the "patent finish," though we do not know that there is any patent about it, as it has been employed in England for years to polish not only shot but powder. Quite a discussion is at present going on in the advertising columns of the sporting papers in regard to this finish, some advocating it strongly while others condemn it as worse than useless, declaring that it fouls the gun and creates friction. We observe, however, that some of those who condemn *black lead* advocate the use of *plumbago*, which is precisely the same thing under a different name. It is, therefore, well that the reader should be informed as to the true character of this material, and its action when used for polishing shot.

Plumbago, graphite, or black lead, is a peculiar form of carbon. It does not contain one atom of lead, and can not possibly *lead* the barrels, as we ordinarily understand leading. It is perfectly non-corrodible, and when applied to shot it protects it perfectly from the action of the air, so that while uncoated shot soon becomes covered with a film of white oxide, the polished article resists the action of corrosive vapors so long as the coating of plumbago remains mechanically perfect. In addition to these qualities, it is the best anti-friction agent known; and if the interior of our barrels could only be kept well covered with black lead, pot-metal guns would shoot nearly as well as those made of fine steel. We have used it, mixed with a little oil, to lubricate shot-cartridges in a muzzle-loader, and

found a decided advantage in its use, the recoil being lessened and the force increased ; but it is so confoundedly dirty that no gentleman could employ it in this way. It might be of service, however, in large punt-guns. So efficient are its anti-friction qualities that immense quantities of it are sold by the American Graphite Company, of New York, for lubricating purposes ; and we are told by engineers and others who have tried it, that it is superior to anything in the market.

These facts being duly weighed, we conclude that a perfect coating of black lead, graphite, or plumbago, is of advantage to shot, and that there are no disadvantages attending its use.

In the chapter on loading we have given full directions for the different sizes of shot to be used. Let the sportsman, therefore, decide what are the sizes best adapted to his gun, and lay in a stock of these kinds, and these only. Three—or at most four—sizes are in general all that are required ; so that we would select from Nos. 1, 2, and 3, that with which, after careful trial, we could do the best work, at sixty yards, on ducks and grouse ; the best of Nos. 4, 5, and 6, for grouse and duck at forty yards ; the best of Nos. 7, 8, and 9, for woodcock and quail ; and of 9, 10, and 11, for woodcock and snipe. If No. 9 suits the gun well, it may be used for woodcock, quail, and snipe, to the exclusion of the others, though when quail are very wild they require a heavier shot than No. 9. In some guns No. 9 shoots close enough for snipe. Above all, avoid mixed shot. Half an ounce of No. 10 and half an ounce of No. 4 mixed together, are no better than half an ounce of No. 4 against duck, and very little better than half an ounce of No. 10 at snipe. With one ounce of No. 7, which would contain about the same number of



pellets, the sportsman would stand a much better chance of bringing down either a snipe or a mallard. Almost all shot sold at retail in the stores gets mixed. Lounging boobies come in, pick up a handful, look at it with the wisdom of owls, and pour it back into the wrong box. We therefore always buy our shot in sacks, as it comes direct from the factory. In this way we are certain of getting it pure. A twenty-five pound sack is not a very heavy investment, but to meet the wants of those who do not care to buy such large quantities, Messrs. Tatham put up shot in five-pound bags, which are very handy. We generally keep on hand a twenty-five pound bag each of Nos. 3, 5, and 9, and find that they answer all our requirements. The following tables give the sizes of English and American shot:—

SIZES OF ENGLISH SHOT (WALKER'S).

MOULD SHOT.	Pellets to an ounce.		Pellets to an ounce.
L G . . . . .	5½	1 . . . . .	82
M G . . . (hardly)	9	2 . . . . .	112
S G . . . . .	11	3 . . . . .	135
S.S.G. . . . .	15	4 . . . . .	177
S S S G . . . . .	17	5 . . . . .	218
PATENT DROP-SHOT.		6 . . . . .	280
A A . . . . .	40	7 . . . . .	341
A . . . . .	50	8 . . . . .	600
B B . . . . .	58	9 . . . . .	984
B . . . . .	75	10 . . . . .	1725

It must be borne in mind that the number of pellets to the ounce is seldom constant. The screens wear away and allow larger and larger pellets to pass through, so that just before they are renewed the number of pellets to the ounce frequently varies considerably from what is regarded as the standard in new screens, though this variation hardly ever

amounts to enough to affect our practice. We believe that there is no fixed standard among our American manufacturers, a circumstance which is to be greatly deplored. In the following table we give the sizes as determined by ourselves, from very careful weighing of shot procured direct from the manufacturer:—

## TATHAM'S PATENT FINISH SHOT.

*Number of pellets in one ounce of*

Buck, 000 . . .	5½	No. 1. . . . .	76
“ 00 . . .	7	“ 2. . . . .	90
“ 0 . . .	8	“ 3. . . . .	112
“ 1 . . .	11	“ 4. . . . .	146
“ 2 . . .	14	“ 5. . . . .	189
“ 3 . . .	21	“ 6. . . . .	246
T T . . .	27	“ 7. . . . .	333
T . . .	30	“ 8. . . . .	424
B B B . . .	37	“ 9. . . . .	541
B B . . .	51	“ 10. . . . .	642
B . . .	63	“ 11. . . . .	767
		“ 12. . . . .	907

**Caps.**—Good caps should explode sharply and certainly, and ignite the powder easily; they should not fly to pieces, or corrode the gun. Thin G. D. caps are dangerous to the eyes, and even though there be no danger in ordinary shooting, yet if the sportsman should try to make a perpendicular shot he runs great risk of having his eyes injured. Heavy caps alone should be used; and very excellent ones are now made in this country. Three fourths of all the English caps in market are made in Connecticut; and it is cheaper and better to get the genuine American article than to buy something of the same kind with a false label on it. We use the caps made by the Waterbury Flask and Cap Company, and find them excellent.

There are two kinds of explosive matter used for caps: one is fulminate of mercury, and the other is a mixture of chlorate of potash, sulphur, and sulphuret of antimony. The fulminate of mercury is not at all corrosive, while chlorate of potash gives rise to very destructive gases. It is easy to tell whether a cap is charged with one or the other, by exploding a cheap cap and one of Eley's best over a spirit-lamp in a dark room, and comparing the colors of the flames. The chlorate gives rise to a flame of a color very different from the mixture of fulminate of mercury and gunpowder, which is used in the best caps.

**Wads.**—No sportsman will use anything but good wads over his powder and shot. Paper, tow, etc., are dangerous and ineffective. The same charge of powder and shot when covered with good wads will kill one third farther than when held in place by means of paper; therefore the sportsman can not be too careful in the selection of this article. As a general rule, we use Eley's best. They are somewhat expensive, but they carry the shot well and clean the gun thoroughly.

Leather, old hats, pasteboard, and the like, have all been recommended, but we dislike them all. Pasteboard is the least objectionable; and, if the reader should be driven to cut his own wads, he will do well to use it.

Some time ago we made a very extensive series of experiments on the effects of different wads. The wads which worked best were some that we made ourselves out of very hard and thick pasteboard, covered on the upper side and over the edges with soft felt hat, attached by sewing, and lubricated with oil and plumbago. These, when used over the powder, carried the shot very hard and close, but they were altogether too troublesome to make, and too dirty to use.

**Powder-Flask.**—This should be made of stout metal, struck up in two pieces, which are joined together along the middle. The spring should be free and sharp, and the fittings of the cut-off so accurate that neither powder nor flame can pass through. For a really good flask the purchaser must pay a good price. Cheap flasks are dangerous, and should be carefully avoided. Excellent flasks can now be obtained of American manufacture.

**Shot-Pouch.**—This has entirely displaced the old shot-belt. Two kinds of pouch are now in market. The first, of which we have seen none but those made by Dixon, of Sheffield, cuts off the charge from the body of the shot by a turn of the charger; the other, which is now made extensively in this country, operates by means of two slides or gates, the rear one opening when the charge falls into the measure, and closing when it is about to be poured into the gun. We prefer the former kind, as being the most accurate, but either kind works well.

**Cap-Chargers** are a convenient mode of carrying caps, and answer very well in cold weather, when one's fingers are numb, but we never use them.

Every gun should be provided with nipple-wrench, screw-driver, spring-cramp for the locks, oil-can, and probes, wiping-rods, etc. These are best kept in a case, very excellent ones being sold for about ten dollars. When a gun is kept in a neat case, and carefully cleaned before being put away, it will last three times as long as if kept lying about; and if the sportsman should wish at any time to dispose of it, it will sell for nearly twice as much.

### HOW TO LOAD THE GUN.

Under this head we have to consider not only the best quantities and proportions of powder and shot, but the

proper mode of inserting the charge in the gun. If the weapon be a breech-loader, full directions in regard to the latter point will be given by the manufacturer; but where a muzzle-loader is used, there is a certain routine to be observed, both for the sake of securing rapidity and certainty, and of avoiding danger.

Both barrels of the gun being unloaded, the following is the system that we always follow: Grasping the barrels with the left hand a few inches below the muzzle, the hammers being at half-cock and the gun in such a position directly in front that the trigger-guard is toward the person, we measure out the proper quantity of powder for a load, and pour it into each barrel in succession; and, after returning the flask to the pocket, insert a cut wad in each barrel, draw the ramrod, and press it gently to the bottom. For doing this, Frank Forrester gives some very excellent advice, as follows: "Remember not to grasp the rod, much less cover the tip of it with the palm of your hand, in ramming down, but to hold it only between the tips of your fingers and thumb. In case of an explosion, this difference in the mode of holding it will just make the difference of lacerated finger-tips or a hand blown to shreds."

The rod may now be held in the same hand that supports the barrels, while the shot is carefully measured and poured into them; wads are again inserted and pressed home, and the ramrod returned to its proper place. All that now remains is to cap the piece, and see that the hammers are at half-cock.

If these directions be minutely followed, no danger can possibly be incurred, and the piece will be certain to go off if the weapon and the ammunition are of good quality; but, lest the reader should overlook any essential point,

we will venture a few remarks upon some of the steps described.

Frank Forrester and many other authorities distinctly tell us that, during the process of loading, the hammers should lie down upon the nipples, and that if the piece have been recently fired, the old caps should not be removed until after the powder and shot are in place. We acknowledge that where the sportsman is in a great hurry a little time is saved by leaving the removal of the old caps to the same operation as the placing of the new ones. But if time can be spared, it is always best to leave the nipples open, for this simple reason—the ramming home of the wad creates an outward current of air through the nipples, and this current carries the powder well into the tubes, so that a miss-fire is almost impossible. When the hammer rests on the tubes, the latter are hermetically sealed, and the air which fills them resists the entrance of the powder, and a miss-fire is sometimes liable to occur. Nor does the bringing of the hammers to half-cock involve the loss of so much time as would at first appear. The operation is performed during the lowering of the piece from the shoulder; and if the entire process of loading is made a matter of habit, as it ought to be, there will be very little time lost. Moreover, the sportsman ought, by all means, to acquire a regular system, and stick to it. He will then follow out, as it were by instinct, his regular habits during periods of excitement and hurry, and will not make those mistakes which, in the hands of the nervous and inexperienced, render the best firearm little better than a broomstick. Those who have never accustomed themselves to one set round, are apt, when a time for haste comes, to pour all their shot into one barrel and all their powder into the other; to break their ramrod, omit a wad

between the powder and the shot or over the shot, and a dozen other blunders, any one of which is enough to spoil their sport during the remainder of the day. An old hand, on the contrary, loads by instinct: with one eye on the game and the other on his gun, he marks down his birds or watches a grizzly with equal coolness, while powder, wad, shot, and wad, follow each other with the regularity of clockwork and the rapidity of legerdemain; so that ere the novice has his first charge of powder measured out, the weapon of the old sportsman is at his shoulder and discharged. All the result of rule, system, and habit.

In forcing down a wad on the powder, do it with a moderate degree of slowness, as, if the wad be forced down with very great rapidity, the air may be compressed to such a degree as to ignite the charge.

Always see that the barrels maintain such a position that if they should be accidentally discharged the contents will fly past and not through you.

When but one barrel is to be loaded (the other barrel being still charged), it is well to drop the ramrod into the undischarged barrel, in order to make sure that the shock of the explosion has not disturbed the charge in it.

And if, while doing so, a pellet of shot should roll down the wrong barrel and wedge the ramrod so that you can not get it out, do not tug and strain in the hope of extracting the ramrod by main force. By so doing, you will, in all probability, break it, if you do not cause a more serious accident. If you have not already done so, place a wad over the shot that you have just poured in, so as to make sure that it does not fall out; raise the ramrod gently, and while it is in this position, invert the barrels, placing them with the muzzle downward. Then, with the tip of your finger, press the ramrod upward, and the shot

will drop out of itself, after which the ramrod is, of course, easily withdrawn.

Having thus disposed of the *manner* of loading, we now proceed to consider the question, What constitutes the best charge for a gun?

Upon this subject the most diverse directions are to be found. One writer tells us to beware of over-loading, and advises one and a half drams of powder and one ounce of shot as the best charge; another recommends four drams of powder and one and a half ounces of shot. Frank Forrester gives three and a half drams of powder and one and a half ounces of shot as the proper charge for a gun of number fourteen gauge, thirty-one inch barrels, and eight pounds weight. Greener tells us that a fourteen gauge gun should never be loaded with more than one and a quarter ounces of shot, and that one ounce is amply sufficient for a fifteen gauge gun, the amount of powder used being as great as can be conveniently burned. At "The Field" gun trial, two and three quarter drams of powder and one and a quarter ounces of shot was the charge used in muzzle-loaders of seven pounds weight, twelve gauge, and thirty-inch barrels. Breech-loaders were allowed an extra quarter dram of powder.

Our own opinion is that for every gun there is a certain size of shot and weight of charge with which it will do most effectual execution, and we also believe that every gun is best adapted to a special grain and quantity of powder; and that if, by careful experiment, the sportsman will find out just what these quantities and qualities are, he will very soon distance all competitors. To determine all these points, and the best combination of them, is not, however, as easy a matter as might at first be supposed. For, if we find, by experiment, that with a certain charge



of powder and weight and size of shot, a gun does good work, we may, by altering either the weight or the size of shot, find that a different grained powder will answer better; and perhaps the new combination will give better results than any that we have previously tried. Moreover, in shooting different varieties of game under different conditions, different charges must be used. The heavy charges and large-grained shot used for duck-shooting, would be obviously unsuited to woodcock and snipe. Fortunately, however, the latter kind of game does not demand the hardest and closest shooting; and therefore we may adapt our charges to the special purpose we have in view, without seeking to attain the very greatest closeness and force. But if we go in pursuit of ducks or grouse, we will find that our gun will be taxed to the utmost as regards its hard-hitting and close-shooting powers; and therefore it will stand us in good stead to find out precisely the weight and size of shot that can be most efficiently used to cover a space of say thirty inches in diameter at forty yards. To begin our experiments, we must take some size of shot as a standard, and for this we prefer No. 5, as a gun may be loaded with it so as to bring down either a mallard or a woodcock. Beginning then with one and a quarter ounces of No. 5, let us try this weight of shot with various proportions of powder, beginning say with two drams and ending with as heavy a charge as the gun will bear. It is probable that as we increase the charge of powder the shot will be driven harder, but without any very great increase of dispersion at first. Very soon, however, the shot will begin to scatter, and when this feature becomes too prominent, it shows that we have gone beyond the right point. Before decreasing the amount of powder, however, let us take

away some of the shot, trying successively one and one eighth, and one ounce, and noting the results. If a diminution in the quantity of shot, without a diminution in the charge of powder, brings us back to the best shooting of the gun, it shows that one and a quarter ounces is too much ; and for our future experiments one ounce or one and one eighth ounces will answer better as the standard weight of shot. In this way it is easy to find out the best proportions of powder, and No. 5 shot and this gives us a starting point from which we may determine the influence of variations in the quantity and quality of the two elements of the charge. With the standard charge of powder try various weights of Nos. 6 and 4, and if it be found that either of these sizes suit the gun better than No. 5, let it be adopted by all means. Having in this way determined the best size of shot and the proper quantity for a charge, let us now proceed to determine the kind of powder that is best adapted to the particular gun in use. Some authorities intimate that the grain of the powder is determined by the length and calibre of the barrels. It is evident, however, that the character of the breech, and of the channel by which the cap communicates fire to the charge, has a great deal to do with it. Do not, therefore, rely upon deductions based upon general principles, but determine each point by actual experiment. Taking the size and charge of shot that is found to suit best, try it with various quantities of powder of different degrees of fineness. Select that which is found to answer best, and with this charge again test the accuracy of your previous conclusions in regard to the best weight and size of shot.

The object of all this laborious investigation is to find out the charge with which a circle thirty inches in diameter can be covered most evenly and struck most forcibly by

any one of the several sizes—Nos. 4, 5, and 6. It is not a matter of much consequence which, as any one of them will give a good account of duck or grouse at forty yards. Having determined this point, “make a note on’t,” and use the charge thus indicated whenever you have to put forth your best efforts. Nor will you deem the labor too great when you reflect that imperfect performance on the part of the gun renders useless the best skill in finding the game and aiming the piece.

In our own gun, which is twelve gauge and twenty-eight inch barrels, protracted experiment has led us to adopt one and a quarter ounces of No. 5 shot, propelled by three drams of very coarse-grained powder. This charge may not suit other guns of even the same calibre, length, and weight,—as smoothness, freeing, opening, etc., all influence the result somewhat. But we feel convinced that when a man tells us that the great secret of successful shooting lies in using one and a half drams of powder and seven eighths of an ounce of shot in a gun of fourteen gauge or larger, we feel convinced that his experience must have been obtained by shooting at very tame birds. With this amount of powder, of any kind in the New York market, it would be utterly impossible to bring down either a mallard, a quail, or an October woodcock, at forty yards. And when we find authors like Haswell quoting and indorsing these absurd directions, in works intended for practical and scientific men, it tends greatly to lessen our confidence in our popular authors.

The charge which we have described so minutely, is, of course, to be used only in shooting game of medium size at fair distances. If we shoot at long distances, or at very small or very large birds, it will be necessary to make a change in the size of shot used. For very long ranges,

Nos. 3, 2, and even 1, may sometimes prove serviceable. Indeed, we have seen teal ducks brought to bag with BB shot; but in this case the chances were very greatly in favor of the duck. One of these large pellets striking a bird in a vital part, will kill even at a distance of one hundred yards, but the chances against hitting are as a thousand to one. Upon this point, "The Dead Shot" makes the following sensible remarks: "The chances are six to one against killing a sparrow, either sitting or flying, at thirty yards, with No. 4 shot; whereas, with the same gun, at the same distance, a sparrow may be killed with certainty, either sitting or flying, with No. 10 shot."

There are, however, special circumstances under which it is advisable to violate this rule; and to select, if possible, a size of shot which will answer for several kinds of game. Mills, a very sensible writer on shooting, advises the use of but one kind of shot in all such cases, and gives the following reasons for so doing: "For every kind of shooting, when you may wish to be prepared for a pheasant down to a John Snipe, No. 6 will fill your bag, and give you more success than any changeable plan you may adopt. To give an instance of what varying the size of your shot may do, I shall relate a laughable occurrence that befel a young friend of mine, not forty-eight hours previously to my recording it on this page. There were a few ducks reported to have dropped within a short distance from his home. Charging his best double-barrel with No. 4, he sallied forth, bent upon their destruction. In crossing a moor toward the narrow stream in which report stated the ducks were to be found, a couple of snipes flapped from the rush. Bang! bang! roared his piece; but the fleet-pinioned birds threw back a triumphant 'scape,' and winged away, long after every pellet of No. 4 had spent

its force in the air. Assigning the magnitude of the pellets as the cause of his missing, and in the belief that he should find more of the puzzling and quick-winged snipes, he loaded with *dust shot*. Scarcely, however, had he put caps upon his nipples, when a fine mallard rose within easy range. As the broadside poured into him, he merely increased the speed of his departure. Now, supposing there to be no fault behind the trigger, No. 6 would have brought down all three of these birds; whereas by charging with shot for a particular purpose, which the Fates decreed to be frustrated, the whole of them escaped." That there is much force in this illustration, no one can deny. We have often killed snipe with No. 5 shot, and ducks with No. 7, so that it would be fair to expect that No. 6, which is a mean between the two, would prove effective against either or both. And notwithstanding the ease and rapidity with which breech-loaders may be loaded and unloaded, it is utterly impossible to make a change after the bird is on the wing. Therefore, where a variety of game is to be met with, the adoption of a medium-sized shot is undoubtedly the only way to make a bag, though where either snipe or duck are followed to the exclusion of other birds, a size larger or a size smaller would, beyond all question, give better results.

For very long ranges, we must use either Eley's cartridges or very large shot. We prefer the former, as the chances of hitting are much greater where a cartridge is used than where loose shot of large size is employed. With a fourteen gauge gun, seven and a half pounds weight, the heaviest shot that could be used, with any degree of good judgment, would be No. 2, and this could not be expected to retain sufficient momentum to kill at any distance beyond sixty yards, unless it struck a peculiarly vital

part. It is true that a single pellet of No. 2 might fly so strongly for one hundred yards as to kill, but the chances of killing would be quite as great with a rifle as with a shot-gun at this distance. And as the greatest charge that could be conveniently fired from such a gun would be one and a half ounces, containing one hundred and twenty-eight pellets of shot, the chances of hitting, even at sixty yards, would be very slight. With a wire cartridge, containing No. 4 shot, the chances are as three to two that the bird will be killed. Consequently, where game is wild and difficult to reach, we always use a wire cartridge in one barrel, but only in one, as the cartridge carries its shot altogether too closely to be useful at short distances. We speak now, of course, of the green cartridge used for long distances; for we never use cartridges in ordinary shooting, loose shot being sufficiently effective.

For very large birds, such as turkeys, swans, wild geese, etc., large shot must be employed. Experts recommend Nos, 1, B, and even BB. For small game, such as snipe, woodcock, and quail, small-sized shot must be used. The body of any one of these three birds is so small that it takes a close-shooting gun and small shot to hit them at all, though when they *are* struck it does not require a very hard blow to bring them down. Our favorite charge for woodcock and quail is one ounce of No. 8 shot and two and three quarter drams of powder. For snipe we use one ounce of No. 9, which contains twenty-five per cent more pellets. But as it is possible that a size above or below these numbers might suit the gun better, the sportsman will do well to find out by experiment the best size, and use that only.

The sportsman must always bear in mind that where very large or very small shot are used, there will be con-

siderable difference between the weights of equal measures. A given measure of small shot will weigh considerably more than the same measure of large shot, although looking at the large pellets we might think that the opposite would be the case. The point is worth noting, however, as even professedly scientific men have been misled in regard to it.\* The same is true in regard to powder of large or small grain, and it will also be found that a given weight of large-grained powder or large-sized shot will measure much more in a tube of small calibre than in one of large diameter. Mistakes have often occurred from a want of attention to this point, though when it is once brought to the sportsman's notice, he will find no difficulty in making allowance for it.

This also explains in a measure the advantage which arises from the use of large-bore guns for throwing shot. A charge of No. 1, which measures two cubic inches, in a gun of number five gauge, will occupy more than two cubic inches in a gun of fourteen gauge. Mathematicians will find no difficulty in understanding the causes which give rise to this startling paradox; *practical* men who doubt the truth of our statement can easily satisfy themselves by experiment.

To recapitulate; our charges of shot are as follows: Nos. 8 and 9, one ounce; No. 5, one and a quarter ounces; No. 3, one and three eighth ounces; No. 1 and B, one and a half ounces; BB, one and three quarter ounces. It is not claimed that these measures will give equal weights of shot, but when we use a size having so few as fifty pellets to the ounce (BB) we must increase our charge,

---

\* Professor Johnson, of Yale College, tells us in the *Agricultural Annual* for 1867 (p. 77), that a pint of snipe-shot does not weigh as much as a pint of duck-shot! If the Professor will only try the experiment he will find out his mistake.

as with less than ninety pellets the chances of hitting are altogether too small. There are other reasons why the old rule of measure for measure will not hold good. Powder differs greatly in its specific gravity, and, as we have seen, the same weight occupies different spaces according to the size of the grain and the diameter of the tube in which it is measured. To give a table of proportionate weights and measures, as has been done by a recent writer, is to lead to error. Let no man who desires accuracy trust to the old rule of measure for measure.

Before leaving this subject, it may be proper to allude to a method which is sometimes adopted by very excellent shots. It is that of using very light charges of powder and very heavy charges of coarse shot. For long shots this plan answers admirably,—the fact that heavy grains of shot oppose less surface to the air, and consequently meet with less resistance, enabling them to keep up their momentum long after small shot, which started with a far higher initial velocity, has entirely lost its force. The small charge of powder does not scatter the shot as does a large charge; and the result is, that if the gun be well made and carefully directed, a large bird like a grouse or duck may be fatally struck at extraordinary distances. But at ordinary ranges such charges strike the game so as to mangle it horribly, and they are therefore only used by pot-hunters.

This is by no means a new dodge, but has long been practised by those who care more for game than for sport. Colonel Hanger, in his famous book on sporting, gives the *pros* and *cons* very clearly, thus: “Gentlemen-sportsmen, I can have no personal or self-interested view in requesting you for two or three days to shoot with No. 2, patent,—you who at present shoot with Nos. 5 and 6. Don’t begin to try it till October, when the birds are strong, and rise



at a much greater distance. I give you my word, from convincing practice, that two shots of No. 2 will kill a bird at above seventy yards; when seven of No. 5 or 6 will only maim the bird, but wound him so that, although he will fly away, and you never get him, he undoubtedly may die. At least, gentlemen, I think it is fairly worthy of giving it a trial; but let me ask you a question: Do you ever expect to kill an old hare with No. 5 or 6, at seventy yards? Upon my word, she will canter on and laugh at you. I assure you, on my word, *I have killed some dozens above seventy yards with No. 2.* . . . I beg leave to call your attention to two facts which are stated in the foregoing pages: the first is, my having killed a partridge *above seventy yards*,—put three shots into him, two of which went in behind, passed through his body, and went out at his breast. The second is, having killed a hare,—putting three or four shot into her, at *above eighty yards*. Can you do the same with No. 5 or 6? I answer, No, you can not; it is not possible. Upon my word, I should not imagine that I should be in any degree of danger of receiving material injury, were I to allow any person to fire at my hinder parts, at four-score yards, with No. 6, provided I had a good pair of buckskin breeches, and particularly had I a great coat on,—not of any particular thick cloth, but superfine only. I do not believe that any shot would penetrate that coat strong enough even to give me pain. So firm is my preference of No. 2 to No. 5 or 6 that I think the point can not be contested."

That there is much truth in what the colonel states is undeniable, but those who have read his racy though rather plain-spoken book, can not have failed to observe that he is somewhat inclined to *poaching*,—for we do not confine this term to those only who are in the habit of

stealing game and trespassing : it may be properly applied to those who, like Colonel Hanger, resort to traps and unusual methods for catching game. Setting baited rat-traps beneath the surface of water, in the hope of catching wild fowl, is certainly not a sportsmanlike practice.

### HOW TO CLEAN THE GUN.

Our system of cleaning is somewhat different from that usually laid down by the "authorities;" and, whether better or worse, we prefer it to any that we have seen described. As the reader may, however, like to have a choice of several methods, we will describe the processes advocated by the best sportsmen.

Frank Forrester tells us that the residuum of the gun-powder exploded, and of the igniting substance of the copper caps, has the effect of producing the worst sort of oxidation of the metal of the barrels, in a greater or less degree, according to the humidity of the atmosphere, and that the purest barrels are rusted the most easily, and suffer the more detriment by rusting. Therefore, says he, no man who owns a fine gun, or any gun which he values, ought ever to put it aside after use without cleaning, even if he have fired but a single shot. Watts, in the following lines, insists upon the same course:—

"If fired only once a day,  
'Twere wrong to put your piece away  
Unwashed, because you'll always find  
Some filth corrosive left behind.  
As soon as you from sport return—  
(The following words let each one learn,  
Seeing them all in order done)—  
Feed dog—feed self—and clean your gun!"

Herbert (Frank Forrester) directs us to wash out the barrels with *cold*\* water, using a good stout hickory rod and some fine tow wrapped round the brass jag that screws into it. This is to be worked up and down in the barrels until the water passes through perfectly pure, and the tow comes out quite clean. The barrels are then to be filled with boiling hot water, inverted so as to bring the muzzles down, and let the water all drain out; and, after standing five minutes by a warm fire, thoroughly dried by hard friction with fresh dry tow. The interior of the barrels are then to be oiled with a very little oil; the nipples and their seats, as well as the faces of the strikers, are to be cleaned, oiled, and wiped dry.

Similar directions are given by Dr. Lewis, Stonehenge, Blaine, the author of "The Dead Shot," and others, and they are substantially the directions that have been embodied in doggerel verse by Watts.

Having had probably as much experience as most men in the using and cleaning of guns, we have never felt the necessity for using water, under ordinary circumstances. Whenever water is used, it is the most difficult thing in the world to remove it completely from those inaccessible crevices which are to be found in every gun, especially about the seat of the cones and the chambers. Into these the drying-tow can not enter, and the result is that it lies there and corrodes the barrels more injuriously than would the dirt from a dozen charges of powder. For, Frank Forrester and others to the contrary notwithstanding, the residuum from good gunpowder is not very injurious to iron or steel. We have now before us a piece of a very fine barrel, six inches long, in which several charges of powder were fired about six months ago; and after the

---

\* The United States Ordnance Manual directs the use of warm water.

lapse of that time, no corrosion has appeared, though on the outside, where a little moisture was left by contact with the hands, the rust has penetrated quite deeply. As to the corrosive power of the gas from percussion caps, the reader would do well to refer to our chapter on that subject. Well-made gunpowder, when burned, does not leave behind any *acid* residuum, but rather one that is slightly alkaline, and consequently preservative.

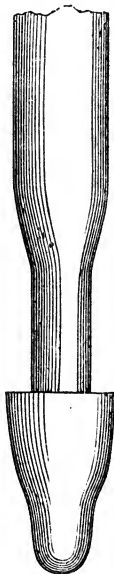
That we do not exaggerate in regard to the difficulty of removing the last traces of water, the following quotation from Dr. Lewis's "Hints to Sportsmen" will show: "If any of our readers doubt this fact, let him clean his gun, and wipe it out as thoroughly as possible with the softest rags; then let him remove the nipples, and he will find a drop of water, or at all events a great deal of moisture, at the very bottom of the chamber. We have tried it over and over again with our guns, and have always found such to be the case."

After a day's ordinary shooting, we proceed as follows: Having drawn the ramrod, and brought the locks to half-cock, we remove the barrels from the stock, and hold them with the muzzle down. We then brush the breeches out carefully by means of a fine brush, made either of brass wire or stiff bristles. The object of this is to remove any solid residuum that may remain in the barrels, and prevent it getting into the cones or chambers. We then take a well-oiled rag—preferably of coarse flannel—six inches square. Tow should never be used, as it is neither as convenient nor as safe. Neither should linen or cotton rags be employed, as they may give rise to serious accidents. A small particle of tow, cotton, or linen, left in the breech of the gun will ignite at the first discharge, and may remain in the barrels and fire the powder that is

poured in to re-load ; and accidents from this source are too common to warrant us in neglecting proper precautions against them. With flannel, woollen cloth, or sponge, such an accident can not occur.

The rag we fold twice, giving four thicknesses, and place it on the end of a stout hickory rod, having a notch around the lower end, as shown in the figure. Both barrels are wiped out with this, the rag being opened and re-folded so as to give eight fresh surfaces. By the time these eight surfaces are soiled the barrels will be perfectly clean. They should then be rubbed dry with a clean rag, after which they may be safely put away, with a certainty that no concealed source of injury lurks within them.

It may, perhaps, be feared that this process must fail to clean out the connection between the chambers and the nipples, and that a miss-fire may possibly be the result. An experience of many years, however, shows us that there is no danger of this, even if the process that we have described be the only operation that is performed. If, however, we occasionally remove the nipples, we have full access to the channel leading to the chambers, and can remove all dirt most thoroughly. We may also mention that the lower end of the wiping-rod should be somewhat the form of the chambers, which may be cleaned by a single thickness of rag, forced in and turned round a few times in them. We therefore conclude from experience that this process is quite as good as that described by Frank Forrester ; and as it does not demand more than



Hickory  
Wiping-Rod

half the labor, and can be performed anywhere—in a hotel, boarding-house, or elsewhere—without making a fuss, we give it a most decided preference.

The kind of oil preferred by us is good sperm. It does not take more than one or two teaspoonfuls to clean a gun very thoroughly, so that the expense is no objection. The best oil for cleaning, however, is kerosene; and if it were not for its abominable odor, and the fact that it becomes converted, after exposure to the air, to a tough, clammy, resinous substance, we would use it altogether. When, however, we find our guns very badly encrusted, we always use a little kerosene, which removes anything of that kind instantly. In such cases, after wiping the gun as thoroughly as possible with a dry rag, we oil it with sperm, and again rub it dry.

A leaded barrel we have never seen. We have often been shown barrels which were said to be leaded, but the encrusting material was not lead. Having long suspected this, we determined to test it; and therefore we collected what some would have called "leading," scraped from our own gun, and samples of the same thing from the guns of half a dozen of our friends, who were famous for the care with which they removed all traces of leading with the scratch-brush. In these samples we could detect no lead ourselves; but lest we might be mistaken, we submitted the so-called leading to a friend who is a well-known chemist, and who analyzed it carefully. The result was that it proved to be mere hardened residuum from the powder. Leaded barrels may exist, but we have never seen them, and feel satisfied that what is usually called "leading," in good smooth barrels, is not leading at all. We therefore make no provision for the removal of lead, and greatly prefer kerosene to the scratch-brush.

The nipple-seats, the groove of the ribs, the corners about the thimbles, and all other nooks and crannies that might harbor dirt, should then be carefully cleaned; and for this purpose there is nothing equal to a stiff brush. For most parts, a tooth-brush answers very well, but the bristles are hardly long enough for cleaning the deep recesses around the nipples. We therefore use a jeweller's plate-brush, which is thickly set with long bristles,—just the thing for the purpose. The whole barrel should be well oiled, and then wiped perfectly dry, as nothing is more disagreeable than a greasy gun. The same remark applies to the ramrod. The stock, if varnished, should be rubbed hard with an oiled rag; and where the wood is finished in oil, instead of being varnished, it is well to rub it occasionally with a rag moistened with furniture-oil,—which is, however, nothing but linseed-oil colored. This should never be done, however, when the gun is to be used again within a few days, as the odor of the oil is anything but agreeable. But if the stock can be exposed to the air for a short time, the odor disappears, and the look of the stock is greatly improved.

The locks seldom require to be removed from the gun, and then only after having been exposed to rain, mist, or snow. The outside should be carefully oiled, and the hammers thoroughly cleaned, especially on the striking faces. In removing the locks, great care must be taken not to injure the wood-work into which they are fitted. No screw-drivers, chisels, or other prying tools, should ever be inserted between the lock and the wood for the purpose of lifting out the former; but, having drawn the screw or screws which hold the lock in place, tap the inside of the hammer very gently with a piece of wood, and the lock will come out without any trouble. By alternately

oiling and wiping every accessible part of the lock, both when the hammer is up and when it is down, the lock may be very thoroughly cleaned and oiled without being taken apart. When it requires taking apart, it should be sent to the gunsmith, unless the owner has considerable mechanical ability. More locks are spoiled by being tampered with by inexperienced persons than by any other cause.

Thorough cleaning is not only necessary for the preservation of a gun, but is essential to its good shooting. Smooth, clean barrels, and free-working locks are great aids in quick shooting and hard hitting.

### HOW TO CARRY AND HANDLE THE GUN.

All who use a gun ought to take great pains in accustoming themselves to carry it in such a way that it will not only be perfectly safe, but ready at an instant's warning to do effective service.

The proper position of the hammers—whether at full-cock or half-cock—is a question which has called forth much discussion. All are, of course, agreed that a gun should never be carried with the hammers down on the caps; for, when in this condition, the catching of a twig or a blow arising from a fall, would infallibly cause an explosion. And as the hammers are not protected like the triggers, there is great liability of their being caught and drawn backwards. When this accident occurs to hammers that are resting on the caps, there is every chance that the hammers will not be drawn back far enough to be caught by the half-bent notch; and, in that case, they fall again on the caps, which are sure to explode.

Some very excellent and careful shots advocate the carry-



ing of the gun at half-cock ; and, so far as mere carrying is concerned, the safety is certainly greatest in this condition. Such shooters always bring back the hammers to full-cock during the act of raising the gun to the shoulder, and we have known some very quick shots who invariably pursued this plan ; but we doubt much if a beginner could ever make snap-shots in this way. It certainly requires considerable practice, especially with the second barrel, and particularly if the second barrel be the left-hand one. If, however, the sportsman have long fingers and steady nerves, he can not do better than carry his gun in this way. Dr. Lewis objects to this method of carrying the gun, on the ground that a nervous man may allow the hammer to slip from his fingers before the tumbler has reached the full-cock notch ; and, in that case, he claims that an explosion would ensue. Surely not. The hammer would merely fall back to half-cock, and stop there.

On the whole, we think that, except in dense covert shooting, where snap-shots are the rule, the hammers are best carried at half-cock.

So far as the mere carrying of a loaded gun is concerned, the great point to be observed is to see that it never, even for a single instant, points in the direction of any living being. Neither should a muzzle-loader ever be carried with the muzzle down. Unless the wads are very tight, the charge is apt to shake loose.

In getting into a waggon, always take off the caps. If the tin-lined cap be used, none of the fulminating powder can adhere to the nipples, and the hammers may be safely let down on the cones. If, however, the caps be of the thin G.D. kind, it is almost impossible to take them off without leaving some of the fulminate behind ; and we have frequently fired off a charge, for experiment, by means

of such residuum. No *sportsman*, however, would use such trash, and therefore we need not dwell upon this point.

On entering a house, always take off the caps. Frank Forrester says leave them on, because to take them off is to represent the gun as unloaded; and some "unchanged idiot" may pick it up, put on caps, and snap it at the head of a woman or child, for the purpose of frightening them. We acknowledge the risk; though, if the gun were ours, we suspect that the risk to the brute who would intentionally point a gun at another, would be almost as great as that incurred by his victim. If able, we would certainly treat him to a severe dose from our dog-whip. But we think that the risk that some child will play with the gun, and discharge it accidentally, is greater still. The safest plan is to discharge the gun or withdraw the charges. All these difficulties are, however, avoided by the use of the breech-loader, from which the cartridges can be extracted in an instant.

Probably the most dangerous operation connected with the ordinary use of a gun, is in letting down the hammers from full to half cock. We are so apt to pull the wrong trigger, and consequently to discharge one of the barrels, that the utmost caution ought to be observed. By holding the gun with the muzzle pointing directly upward, all danger is avoided, for if the gun does go off it can do no harm.

In crossing fences, the utmost care must be exercised. It does not always answer to take off the caps or draw the cartridges, as it frequently happens that a bird will get up the instant we are on the other side. The hammers should always be at half-cock, and the muzzle so kept that it shall not point either in the direction of yourself or of any one else.

## HOW TO LEARN TO SHOOT.

Shooting is not only an art, but a science. It is of no use to be able to throw a charge of shot just where we wish it to go, if we do not know precisely the proper place to send it. Neither will it do us any good to know where the shot ought to go, if we can not send it there. Much both of the science, and of that which relates more immediately to the art, may be learned in the house and from books; but perfection in the art can only be acquired by practice in the field. And it is curious to observe the strange ideas which men have in regard to this point. It takes a boy months to learn to shove the jack-plane, to forge a piece of iron, or to master any of the mechanical arts. When the young draughtsman first takes hold of his tools, his very awkwardness in handling them prevents him from doing good work; and it is only after his hands have become used to them that he can make a fair drawing. But a man who has never before in his life handled a gun, takes up a double-barrel, and expects to be able to kill right and left with it, on the very first trial. Those who entertain such expectations will surely be disappointed.

The first lesson consists in learning how to handle the gun, and this is best learned in the house. Take up the unloaded piece, the hammers being down on the nipples, and practice throwing it to your shoulder for a quarter of an hour twice each day, and you will soon learn to handle it with freedom, and, in a measure, to point it where you will. Bring it up so as to point it at objects in front, on the right, to the left, and high up; and when your muscles have become so used to the piece that it seems to come of itself to the mark, it is time to pass to the next step.

The second lesson consists in bringing the gun to the

shoulder, and discharging it at the instant the sight is thrown upon the object that we desire to strike. This lesson is the most difficult of all, and nothing but steady practice will enable us to acquire it. Various directions have been given for mastering this stage of instruction, such as snapping caps at a candle in an otherwise dark room, practising at a card, etc. The objection to all these is that the aim being constantly taken at the same stationary object, only half the art is taught. Our method is as follows:—

Procure a pair of those rubber caps that are used for the ends of pencils; cut them so that the tube is just the length of the nipple, slit the tubular part up, and tie them on the nipples with small tough twine. Unless the rubber is slit, it will be difficult to tie it on securely. Your nipples and hammer-faces are now secured against injury, and you may snap away as much as you please. Caps do little good. They are not much protection to the nipples, they soil the gun, and the sound does not tend to harden the nerves of the shooter; so we would never advise our readers to snap caps at any mark. With the gun prepared as we have described, the learner should now practice throwing up his gun, bringing it to bear on the object, and drawing the trigger the *instant* the sight is fair. *Never try to better your aim.* By so doing you will acquire the *habit* of seeking after the object over the muzzle of the gun, and you will become nervous, undecided, and what is called a *poking* shot. If you find that the gun does not fully cover the object, never mind. Pull away. What you are now trying to do is to establish a sympathy between the eye, the hand, and the finger; and if you allow yourself to destroy this sympathy by over-riding it for even a few times, you will undo all that you have done. Therefore, draw the trigger

at any rate; and, instead of trying to improve the aim, note your error in aiming, and endeavor to do better next time. Do not act as if you had only one chance, and never expected to fire another shot. It is easy for the pupil to tell when he took a good aim and when he made a poor one; and when he is conscious that he can throw the end of the gun upon any object—right or left, up or down, and draw the trigger as soon as he has caught the sight, it is time for him to undertake the third lesson, which consists of actual shooting at inanimate objects. For this purpose, the gun should be loaded with say one dram of powder and half an ounce of very small shot. This will give no recoil; the explosion will not create any nervous excitement, and yet such a charge will do all that is required of it. Having chosen a place to stand, fix up a dozen cards or old letter-envelopes in different positions all round—some high, some low, some to right and some to left, and at a distance of fifteen to twenty paces. If there are trees where you are shooting, tie an envelope to one end of a string and a stone to the other; throw the stone into the branches of the tree, and the string will probably get entangled in the branches, and the envelope will hang down and present a fair shot. Having prepared a dozen or twenty envelopes, all numbered, take your position in the centre; load your gun, and select one of the cards or envelopes *in your mind, but without looking at it*. Then direct your sight to it instantly, and at the same time raise your piece and fire. Do the same by another, and proceed to reload. Keep a record of the shots by the number of the envelopes. If No. 1 was seen fairly over the barrels at the time of drawing the trigger, mark it *Hit*; if you feel that you shot wide, mark it *Missed*. You can verify these notes by inspection after you have shot at all the cards.

In this way you will learn to tell pretty certainly whether you have struck your bird or not, when you come to shoot at game.

This kind of practice should be kept up until you can bring your gun to the shoulder, throw it on the mark, and discharge it so as to hit nineteen times out of twenty. Remember that the great point is to establish perfect sympathy between the eye and hand; and to do this you must observe strictly the rules laid down in lesson two.

An animated discussion has been carried on for years in regard to the propriety of shutting one eye or keeping both open. Unquestionably the plan of keeping both eyes open is the best, and leads most quickly to efficiency, though there are some very excellent shots who invariably close one eye. The following extract from Watts's "Remarks on Shooting" are pointed and accurate:—

“Follow it not along the sky,  
To take a formal aim, but try  
To draw the trigger just as you  
At your gun's end the object view.  
Nine times in ten the gun is right  
At first, obeying well the sight;  
But if you look, and look again,  
And doubt and waver, it is plain  
Your hand has every chance to be  
Betrayed by such uncertainty.  
Proceed then, as I just have taught,  
The pleasing knack will soon be caught;  
But let me re-advise, for this  
Prevents, I'm certain, many a miss,  
Close *neither eye*; some good shots say  
Shut up your left: that's not *my way*;  
But still a man may take his oath,  
He'd better shut *one eye* than *both*.

I've heard of men (it may amaze)  
Who never care their guns to raise,  
But fire them from the hip as true  
As we can from the shoulder do;  
I mention this that you may see  
How motion doth with sight agree:  
If you're collected, I believe  
Your eye will ne'er your hand deceive."

The truth is that the great secret of success lies in this perfect sympathy between the eye and the hand. The archer does not shut one eye and look along the arrow when he wishes to strike a mark, and yet many savage nations are so expert with the bow that they kill small animals when running, and even bring down little birds on the wing with this weapon. Vaillant informs us that the boors in the neighborhood of the Cape of Good Hope, when following the plow, are frequently accompanied by numbers of small birds that pick up the worms and grubs thus exposed to view, and so dexterous are these men with their long whips, that any of the little fluttering objects to which their attention is directed, will be struck by them with the greatest nicety possible. In doing this, they never shut one eye. Neither does the carpenter when he drives a nail, or the blacksmith as he swings the ponderous hammer. The fly-fisher when he casts his fly lightly to the very spot where the trout lies, does it with both eyes open; and those who, at base-ball, try to catch or strike a ball, never shut one eye. All these instances are cases of sympathy between eye, hand, and finger. That this may exist in very great perfection when only one eye is used is undoubtedly true, but those who have to learn from the beginning had better learn with both eyes open.

One of the great points is to learn to shoot rapidly, that is, to allow as little time as possible to elapse between the formation of the resolution to fire and the act of firing. He who raises his gun and dawdles with it, is a poking shot; he who always fires on the first impulse is a snap-shot; but he who with perfect coolness makes all his calculations rapidly, and then with lightning-like dexterity discharges his piece, is a quick shot and a good sportsman. "I am very desirous of making clear the distinction between a snap-shot and the quick and dashing one that I wish my pupil to become. I have seen some men knock down their birds the moment they topped the stubble; and, heedless of the nearness, they thus cut their game into ribbons. This is called 'snap-shooting,'—a system I do not admire or recommend. If you make a practice of pulling your trigger immediately the game presents itself to view, you will not be able to give sufficient time to a close shot; and I prefer seeing a bird fly away, to its being mangled. There is a want of coolness and style in 'snap-shooting,' too, which makes a sportsman, however proficient in the knack, look many inches from the crease of perfection in his art.

"If a bird rise at a long distance—say fifty yards—a snap-shot will suit admirably. The bird must be hit directly it is on the wing, or the attempt may as well not be made. To say, therefore, that a snap-shot is *never* to be made, would be wide of my meaning; and, to be able to make one is a great accomplishment. But what I wish to inculcate is the *rule*,—not the exception. In these long ranges, a slow shot can do nothing. Very likely, he will bring his gun to his shoulder, shut his left eye, and get his muzzle on a level with the bird; but, by the time that he has done so, he discovers that the bird is too far off,



and that it is useless to pull the trigger. I have frequently seen this farce performed by men who would back themselves to kill their twenty consecutive birds. No wonder, when they would permit twice as many, and perhaps more, to go without firing a single barrel at them,—three fourths of which shots a legitimate sportsman would have taken as a matter of course.

“The great difference between a *quick* shot and a *snap* shot is, that the former discriminates between long and near shots,—taking his level and firing in accordance with the distance at which the game springs, while the latter exercises no such discrimination. Far or near, the instant the bird is seen, or the rabbit pops his ears out of the gorse, the snap-shooter fires; and if he were to hesitate for a moment, when his gun is at his shoulder, he would miss.”—*Mill*.

While waiting for a bird to get off to a reasonable distance, or to get into a proper position, never stand with your gun to your shoulder and your eye looking along the sights. Such a practice is not only clumsy and inelegant, but it tends to make the young sportsman a poking shot. When looking for game, keep your wits about you, and always be prepared for any emergency. If a bird should spring at your feet, try to control your nerves; keep your eye fixed on him, and hold your gun firmly but easily in the hands, the barrels horizontal, the left hand just in front of the trigger-guard, and the right hand on the *grip*, as it is called, which is that part of the stock that lies immediately behind the lock. The fingers should be in such a position that the hammers and triggers are within easy control, and the gun should be held just below the point which the elbows occupy when the arms hang down. Standing in this position, watch your bird until distance

or some peculiarity of position, such as his being about to fly behind an obstruction, shows you that it is time to fire. Then raise your gun quickly but deliberately, and fire. If you have practised well in the preceding lessons, and pay sufficient attention to the rules which we are about to lay down in regard to shooting at objects in motion, your bird will, in nine cases out of ten, come to bag. In all this there are two things which it will be well for you to remember. In the first place, with such charges as we have described, and with ordinarily good guns, thirty yards may be considered the most fatal distance at which we can fire. Most good shots will kill a bird with greater certainty at this distance than at any other. Secondly, remember that the *first* movement of all land birds is exceedingly rapid. It is not *flight*, for the wings have not yet had time to come into full action: it is a *jump*, aided slightly by the wings. When you wish to make a snap-shot at long distances, the best time to do it is just when the bird has reached the highest point of his upward jump, and before he has had time to get under way on his horizontal flight. A little practice and observation in the field will enable you to take full advantage of this.

The fourth lesson brings us to the striking of objects in motion; and if the previous lessons have been faithfully practised, this is by no means the most difficult part of the shooter's art. To find objects in motion to shoot at, however, is not so easy. If we have a companion or a teacher, very good practice may be obtained by shooting at stones, apples, turnips, or potatoes, thrown into the air. When there is a slight breeze, we may get good shots at pieces of paper, five or six inches square, allowed to float off on the wind. But the best practice of all may be had at the mechanical pigeon. This consists of a piece of light sheet

iron, shaped like the propeller of a vessel, which is caused to spin rapidly by means of a cord and spool. As soon as the spinning motion attains a certain velocity, the pigeon glides off, rises into the air, and shoots away with considerable speed, and for some distance. When there is a strong wind, the motions of this object are very irregular and sharp; and, consequently, to hit it tries the skill of even good shots. Hitherto, these mechanical pigeons have been imported from England at high prices, but we understand that preparations have now been made to manufacture in this country and sell them for a very moderate sum. The art of throwing off the pigeon is so easily learned by those who possess the article, that no description is necessary. Two forms are made. In one the spinning apparatus is held in the hand, and the pigeon is thrown in any direction, by inclining the handle to the desired point. The other and better form is furnished with an iron stake, which is driven into the ground, and the spinning portion is inclined by means of a very simple but ingenious universal joint. The instrument may be set at eighteen or twenty-one yards, and the spool caused to revolve by means of a long line. If placed about ten yards off, the shooter may pull the cord himself, and obtain most excellent practice. But in most cases it is easy to get a boy to go along and pull the string, for the sake of seeing the pigeon go up and get shot. The shot-marks are very easily detected on the sheet-iron,—which should, however, be varnished or oiled over when the day's sport is done. In this way, the fliers—of which from fifty to one hundred should be provided—will be in readiness by the time they are again wanted.

There is another kind of mechanical bird imported, and called the gyro-pigeon, which may be set up at a distance.

It is more expensive. The flier is caused to rotate by means of a spring, and the flight is not so strong.

Other than these we know of no inanimate objects that will afford practice; so that, after having become tolerably perfect in the lessons we have described, we must take to the field, and practise either at game or small birds. Fortunately for the sportsman, and unfortunately for the farmer, some men of more money than brains have imported the English sparrow into this country. No bird affords finer practice just before the shooting season opens; and in a few years they will swarm around every grain-field, so that the farmer will implore the young sportsman to thin their numbers with the shot-gun. They may sometimes be killed in large numbers while sitting on the stacks of grain; but as a general thing they do not "pack" until late in the fall, so that they must be taken singly. Shoot them on the wing, right and left; use three quarters of an ounce of No. 10 shot and a dram and three quarters—or, for wide-gauge guns, half a dram more—of powder. With this charge, you can kill every time at twenty yards, and you need never take a shot above ten paces, as they sit very close. Practise hard on them, as you will benefit the farmer and wonderfully improve your own shooting.

In shooting at objects in motion, whether animate or inanimate, it is necessary to shoot in front of the object, for two reasons. In the first place, a perceptible time elapses between the impulse to pull the trigger and the expulsion of the charge; and, in the second, the shot takes some time to travel from the muzzle of the gun to its destination. At a rising stone, therefore, we must shoot from six inches to a foot above it; when falling, the same distance below it. When the object is crossing in front of us, we must shoot on the line of its motion, and at least one

to three feet ahead, according to its velocity. Never fire at stones, swallows, etc., when they are poised and stationary in the air. You might as well shoot at a fence-post. For inanimate objects and birds of no great swiftness, these rules are all that are necessary; but for our more active game-birds, more definite directions are needed, and will be given in the next section.

It may be safely asserted that almost all young shots shoot behind and below their birds, and this not because they do not *know* how the gun ought to be aimed, but because they fail to embody this knowledge in their practice. This generally arises from the following cause: the young sportsman looks at his bird, makes as he supposes the proper allowance, and fires. But he forgets that from the time that he brings the gun to bear on the proper spot until the time when his finger obeys the impulse to fire, there is an interval almost as great as that which he ought to allow for the flight of the bird.\* There are two ways of getting rid of this error: one is, to find out by experiment how much it is, and make a constant additional allowance for it; the other is, to keep the muzzle of the gun constantly moving in the same direction as the game, and just as far ahead as the allowance for distance, rapidity of flight, wind, etc., requires. The latter plan we consider altogether the best, and it has been generally recommended and practised, though for reasons very different from those which cause us to adopt it. Most writers on shooting tell us that the shot, after leaving the gun, partakes of the side motion which we give to the barrels, and, instead of going to a point in the line of the aim, it goes to a point ahead

---

\* This interval is known among practical astronomers as the "personal equation," and has been found to differ considerably in different individuals, and in the same individual under different conditions of the system.

of it, just as in the well-known philosophical experiment, where a body acted upon by two forces does not pursue either of them, but moves along the diagonal between them. Unfortunately this law finds no practical application here, for the simple reason that the side velocity which we can impart to the barrels of the gun by means of our hands, is so small that it can not affect the result to any perceptible extent. In *addition*, therefore, to the effect produced by keeping the gun in motion, we must make all the other allowances, which are more fully detailed in the next section.

Having made himself familiar with the principles of this subject, practice alone can confer that dexterity which will enable the young sportsman to put them in successful operation.

### FINISHING TOUCHES.

He who has faithfully followed our directions thus far, practising under each lesson until he can do what is required without giving his whole attention to the acts to be performed, so that his observing powers may be left free to watch every movement that is going on around him, will find no difficulty in making a good bag whenever game is moderately plenty. Indeed, with the aid of a good dog and a slight knowledge of the habits of the animals of which he goes in pursuit, he will do well in almost any part of the country. Occasionally he may miss the fairest shots—a thing which occurs to the oldest and most experienced sportsmen—and frequently he will find chances that are so difficult, that, to kill under such circumstances will be the exception and not the rule. It is to enable him to make sure work of these difficult cases that we give the following hints:—

Hitherto the objects of the learner's markmanship have been such that adherence to very general rules enabled him to strike them. Besides this, the distances have been moderate, and pretty accurately known, so that allowances on this score were either unnecessary or very easily made. It is when the distances at which the objects are fired at, and the rapidity with which they move, vary between wide extremes, that it will require all the judgment and skill at the command of the sportsman to insure success; and this success will depend greatly upon the accuracy of that instantaneous estimate which he is necessarily obliged to form under such circumstances. The necessity for accurate knowledge, not only of the powers of our weapon but of the rate of motion and character of the game, will be easily seen from the following considerations. Let us suppose a wild duck going down wind at ninety miles an hour, as they frequently do, and that the sportsman fires at it from a distance of fifty yards—a very ordinary range, by the by. At this distance it will require at least an ounce and a half of No. 3 or 4 shot to do efficient execution; and, if the gun be a good one, the charge will cover evenly a space very little more than thirty inches in diameter. To insure killing the bird, it must be found at a distance not greater than fifteen inches from the centre of the charge, and unless it be within a radius of ten inches, it is by no means *certain* that the game will be bagged. Let us then consider the estimates that are required to insure this result, and the accuracy with which they must be made. First, as to aim. If the gun be thirty inches long, a variation of half an inch in the position of the muzzle will bring the bird outside of the charmed circle, and he will escape. The author of "On the Wing" tells us that a variation of one or two inches at the muzzle of the gun will not affect

the killing character of the shot.\* At twenty-five yards the least of these distances would cause a miss, unless a stray pellet happened to strike the bird.

Let us now consider the allowance to be made for the bird's motion. Flying at the rate of ninety miles per hour, the bird will pass over one hundred and thirty-two feet every second. Now, the average velocity of shot from a gun is probably under one thousand feet per second during the first fifty yards. The initial velocity of a rifle-bullet is about fourteen hundred feet per second; and if we grant that a charge of shot has the same initial velocity, it is not too much to say that it will be reduced to the initial velocity of a pistol-bullet before it has gone fifty yards. This, according to the United States "Ordnance Manual," is six hundred and three feet per second, and this gives an average velocity during the whole distance of about one thousand feet per second. That the shot will suffer this rapid reduction in its velocity no one will doubt who has studied carefully the effect of air upon projectiles moving at a high velocity. Robins estimates the resistance of the air to a twenty-four pound shot as being equal to a steady pull of four hundred pounds against its motion; and he calculates that if it were not for this resistance, such a shot would attain a range of about twenty-five miles! He even cites a case in which, if it were not for the resistance of the air, the ball would range forty-seven miles! And since this resistance increases as the square of the velocity, giving a four-fold resistance for a double velocity, and twenty-five times the resistance for a five-fold velocity, it is easy to see that the shot will suffer the greatest reduction of speed during the early part of its flight. This is especially true

---

\* And this although he tells us (p. 21) that the space covered is but thirty square inches, which would give a circle about six inches in diameter!



when we remember that the shot, as it leaves the muzzle, has the form of an *elongated ball*,—the very best form for a projectile to escape the resistance of the air. But as soon as it has gone a few yards, the same projectile spreads out so as to cover an area equal to that of a twenty-four pound cannon-ball; and it will therefore meet with the same resistance that is encountered by such a ball moving with equal velocity, while it has not one three-hundredth part of the weight of the cannon-shot, and consequently not more than one three-hundredth part of the momentum or power to overcome this resistance. The shot would therefore require rather less than the one sixth of a second to reach the bird, which, during this time, would have flown upwards of twenty feet! It is true that this is an extreme case, but such instances have occurred, and it shows us that an error of fifteen per cent in our estimate of distance or speed, will throw the shot before or behind the bird. How shall the young sportsman proceed, so that he may learn to make these estimates accurately and unhesitatingly?

First of all, learn the power of your gun, and the way in which it throws its shot. Fire it with standard charges (as described in the chapter on loading) at various distances—fifteen, twenty, thirty, forty, fifty, sixty, and even seventy yards; and at these latter distances use also shot of large size—Nos. 2, 3, or 4. In this way you will acquire an accurate knowledge of the space covered, and the force with which the shot is driven. Moreover, all shot falls as it flies from the gun. If the flight be continued for a second, it will fall sixteen feet, by the action of gravity alone. Most guns have the rib so elevated that the gun shoots upward, and compensates for this deflection. See if your gun is so compensated. To this end, fire several

shots with the most careful sighting—preferably from a firm rest—and see whether or not the body of the shot strikes above or below the mark. Then, in future adjust your aim accordingly. And, by the way, in shooting from a rest, see that the gun is placed upon some soft substance, such as an old towel or handkerchief. We have known a fine gun to be badly scratched by being fired from a rest in careless hands.

The next step is to learn to estimate distances accurately. All crack shots are good judges of distance and speed. This is best attained by practising when you are out walking. Throw your eye forward in the direction in which you are going; fix upon some object at thirty to forty yards off; estimate the distance, and then count the paces to it. You will find that the average length of a pace is very nearly regular; so that if you step off one hundred paces and then measure this distance accurately, you will come pretty near the average length of one of your steps, and can thereafter measure off thirty, forty, or fifty yards, with great accuracy, by merely walking over the ground.

Another important point is to learn the apparent length of one, two, ten, or twenty feet, when viewed from various distances. Mark off ten feet on a fence, step back forty yards, and observe the apparent length of the ten feet. In this way you gain most important information; and a little practice will enable you to measure off two or three feet ahead of a duck with great accuracy.

To learn to estimate the velocity of a bird is a much more difficult matter, for the simple reason that we have no accurate means of measuring the time and space that go to make up this velocity. Watching birds flying parallel with a railroad train moving at known speed, we are inclined to estimate the *ordinary* flight of common birds at

about twenty miles per hour. Quail and grouse, when flying from the sportsman, move much more rapidly,—at least forty to fifty miles per hour, and frequently sixty. But all these birds vary greatly in the velocity with which they fly. The slow sailing flight of the pigeon, when examining a field for a good feeding-place, is very different from that of the same bird when it shoots away like a rifle-bullet, at the sound of the gun.

But while a careful study of all these points goes to make the finished performer, let not the young shooter despair because he can not always kill at long range, or under circumstances of peculiar difficulty. The degree of skill which may be attained by patience and practice is wonderful ; but even from the first, he who has intelligently studied his weapon, and carefully practised the lessons we have given, will be able to kill game respectably. The practice required is not greater than that frequently given by some ambitious little girl who wishes to shine in playing an ordinary air upon the piano ; and that the attainment of skill by those whose physique and habits adapt them to the sports of the field is something to be desired, none who have tried them will doubt. Some of our most earnest philosophers and poets have been noted for their fondness for the gun and rod ; and it would be hard to tell how much of that vigor and earnestness which Davy displayed in his great researches, was derived from the hours spent in the pursuit of game, or how much of the inspiration which fills the charming poetry and romance of Scott, we owe to the same source.

#### USEFUL HINTS.

It is to be presumed, as a matter of course, that every young sportsman desires to so conduct himself when in

the company of others, that the general good feeling and success of the party may be promoted. Most young hands err, rather from want of thought and from excessive eagerness, than from wrong intentions; and therefore the following hints, by an old English sportsman, may not be out of place:—

“When you are shooting in company, among your first resolutions should be, not from any temptation to endanger the safety of your companion; or to vex and annoy him by jealous, unfair, and greedy monopolizing of shots. Regarding the first part of the caution, there is nothing more *unsportsmanlike*; and, as to the second, there is nothing more ungentlemanly in the field.

“If you are doubling a hedgerow, in the society of a friend, whatever may be the inducement, never fire through the hedge. You may feel quite certain, at the moment of pulling the trigger, that no evil result can happen,—as you are assured that your companion is out of the line of the charge. Without doubt this has been the conviction of many who have had sad proof of their mistake. Therefore, on no account whatever should there be the semblance of a deviation from this resolve. It is impossible to impress this too strongly on the minds of young sportsmen. Let them treasure the admonition as priceless. Shooting across your companion, striving to ‘wipe his eye,’ and taking every shot that goes as fairly for him as for yourself, is conduct essentially opposite to that of a gentlemanly sportsman. It is certain to create irritation: that feeling may spur him to retaliate, and thus unpleasantry and ill feeling will be engendered in both, greatly to the detriment of sport. To *count* also your own number of shots against his, and thus, by comparing one with the other, praise yourself at the expense of his failures, is a boyish and silly

proceeding. If you shoot better than he does, he can not fail to know it; and, should you shoot worse, he will evince a polite forbearance by disregarding the balance of skill in his favor."

All birds that cross belong exclusively to that person to whose side they bear; and there should be an understanding that the shots be taken alternately, when as fair for one as for the other. We do not mean that if a *covey* spring on the *left*, the shooter on the *right* is not to fire; but he is to take the bird which is nearest to him on the right. In the event of a single bird rising, and crossing in the same manner, he ought not to pull his trigger until his companion has tried both his barrels; but if a brace rise at the same moment, in a corresponding form, there is no reason for showing this generosity. Take the one nearest to your side, and the liberality proper to be shown will be accorded.

Always make it a rule never to fire into a covey or flock of any kind of game-birds. The only birds that true sportsmen ever fire at in this way are ducks; and even then the practice is "more honored in the breach than in the observance." By firing into flocks we wound many more birds than we kill: these fly away, die in inaccessible places, and are lost to the sportsman. On the other hand, he who selects an outside bird, and brings it down handsomely, obtains a much higher gratification than can ever fall to the lot of the pot-hunter. In addition to this, the outside birds are always heaviest and in best condition. Especially is this the case in the fall, when the best feeders and fattest birds generally lag a little behind the rest.

Never condescend to *poach*,—that is, to use unusual methods for killing game, or to kill it out of season.

it is to be well rubbed over with a *steel scratch-card* or *scratch-brush*, until the rust is entirely removed; the mixture may then be applied again, as before, and in a few hours the barrel will be sufficiently corroded for the operation of scratch-brushing to be repeated. The same process of scratching off the rust and applying the mixture is to be repeated twice or three times a day for four or five days, by which time the barrel will be of a very dark brown color.

“When the barrel is sufficiently brown, and the rust has been carefully removed from every part, about a quart of boiling water should be poured over every part of the barrel, in order that the action of the acid mixture upon the barrel may be destroyed, and the rust thereby prevented from rising again.

“The barrel, when cold, should afterwards be rubbed over with linseed-oil or sperm-oil. It is particularly directed that the steel scratch-card or scratch-brush be used in the place of a hard hair-brush, otherwise the browning will not be durable nor have a good appearance.

“VARNISH FOR BROWNEED IRON.

Shellac, . . . . .	1 ounce.
Dragon's Blood, . . . . .	3-16 of an ounce.
Alcohol, . . . . .	1 quart.

Greener makes the following statement on this subject: “The best method of staining barrels is by the following recipe; but one material fact must not be overlooked. A considerable difficulty exists in staining barrels all steel; in such a case, therefore, the acid should not be so much diluted.

Muriate Tincture of Steel, . . . . .	1 ounce.
Spirits of Wine, . . . . .	1 “
Muriate of Mercury, . . . . .	$\frac{1}{4}$ “
Strong Nitric Acid, . . . . .	$\frac{1}{4}$ “
Bluestone, . . . . .	$\frac{1}{8}$ “
Water, . . . . .	1 quart.

“These are to be well mixed, and allowed to stand a month to amalgamate. After the oil or grease has been

removed from the barrels by lime, the mixture is laid on lightly with a sponge every two hours. It should be scratched off with a steel-wire brush, night and morning, until the barrels are dark enough; and then the acid is destroyed by pouring on the barrels boiling water, and continuing to rub them till nearly cool.

“The Birmingham people brown their barrels of inferior quality in the following way, to make them look equal to the best. They dissolve as much muriate of mercury as can be taken up in a dram-glassful of spirits of wine: this solution is mixed with one pint of water, or as much diluted as the person requires. A small quantity of the mixture is poured on a little whitening, and laid on the barrel with a sponge, rather lightly; as soon as dry it is brushed off, and a fresh coat laid on; and so on until the barrel is dark enough, which is generally about two days. The effect that the mercury has on every one of the joints of the fibres is wonderful: it never fails to make them, in two or three days at most, a beautiful brown; while the other parts being harder, remain, comparatively speaking, quite light. The rust is killed by hot water; but after that, the barrels are suddenly immersed in cold water, which has the effect of heightening the brightness of both colors. The appearance is beautiful, and equally as fine to the eye as stub barrels browned in the same way; though the process is mostly used for the charcoal iron and the threepenny iron barrels. The only method in which there is no deception, is the smoke brown or stain; and, plainly speaking, this and no other is the reason the gunmakers condemn it. As the acid is decidedly weaker, and of course less liable to impart injury to the iron, no barrel can be browned by it, to look well and fine, but the best; or, in other words, none save those possessing steel in their composition. The method of staining is this: The barrels are anointed with a little vitriolic acid, to cause the iron to receive the effect of the gas more readily; it is then washed off, and the barrels rubbed dry. The forge fire must then be lighted, and blown up with coal possessing as much

hydrogen and as little sulphur as possible. When the coals are burnt till they give out a clear white flame with no black smoke around it, the barrels must be passed gradually through that flame backward and forward, until the whole are covered with a black sooty covering. Place them in as damp and cool a cellar as can be procured, and allow them to stand for eighteen hours; at that time, if the place is sufficiently damp, the iron parts will be found covered with a red rust, while the particles of steel still retain the original sooty cast. Scratch these off with a steel brush, the same as by any other method of staining; then take a piece of linen cloth, and wash or polish the barrels with water and a little washed emery,—when the steel will be found of its original bright color, and the iron a shade darker, with the outlines of both distinctly preserved. Rub the barrels dry, and again pass them through the flame precisely as before; but, above all things, be careful not to allow them to remain in the flame till they become hot enough to melt the solder. When you have once passed them through, do not be in a hurry to pass them again, but in both be guided by moderation: neither allow them, after the first time, to stand to rust more than twelve hours each time. Polish them as before, and you will find them a shade darker at every smoking. Persevere, until they become as dark as you wish to have them. The utmost you can obtain is a fine purple-black color on the iron; and on the steel a shade inclined to a copper color: but if proper attention be paid to the polishing, it will not change much from its original color. The barrels are taken out of stain in the same way as in other recipes, by hot water; but you must continue to scratch or brush them longer, for by that means you obtain a greater gloss."

**To Remove Old Browning.**—Plug the vent and the muzzle of the barrels; immerse the browned parts for one hour in boiling lime-water or lye, to remove the varnish or grease; wipe them, and put them in vinegar, in a



wooden trough, for half an hour or an hour, when the browning may be rubbed off with a rag.

**To keep Barrels from Rusting.**—One of the great difficulties which the sportsman has to contend against is the rusting of his barrels, even when protected by the best browning. The alkaline matter existing in snow and in rain, under certain conditions of the atmosphere, works through the best coatings, and reaches the iron. Varnish, as ordinarily laid on, is objectionable, as it gives a gun a "Brummagem" look. The best plan is the following: Heat the barrels to the temperature of boiling water (not any hotter, or you may injure them), and rub them with the best copal varnish, giving them a plentiful coating. Let them remain hot for half an hour, and then wipe them clean with a soft rag. In this way you can get enough of the varnish into the pores of the metal to act as a preservative, and, at the same time, no one would suspect that the barrels had ever been touched with varnish. We have applied boiled oil, beeswax, paraffin, and some other substances, in the same way, and obtained good results; but on the whole, we find nothing better than good copal varnish.

**To Clarify Oil.**—Very excellent oil is now sold by the agents of most sewing-machines. We have used that supplied by the Singer Sewing-Machine Company, and find it excellent. Fine animal-oils are most suitable for the fine works of the lock; and when a first-rate article can not be obtained, ordinary sperm-oil may be clarified by keeping it in a bottle with some thin shavings of lead. The impurities collect on the lead and sink to the bottom, and the pure oil may be poured off.

**Waterproof Clothes and Boots.**—Where the hunting-grounds are very wet, as is frequently the case in snipe and duck shooting, it is absolutely necessary that the sportsman should be provided with waterproof boots.

Boots made of India-rubber can now be obtained of very moderate price and very convenient form. Some sportsmen, however, object to rubber boots, and prefer leather, which should be well dressed with some preparation that will enable it to resist moisture. One of the most easily obtained dressings is neat's-foot oil, which should be well rubbed in before a good fire, while the leather is damp. Linseed-oil is sometimes recommended, but it is objectionable, as it dries and renders the leather hard and liable to crack. Another very good mixture is composed of equal parts of lard and common resin melted together. Colonel Hawker's recipe is as follows:—

Boiled Linseed-Oil, . . . . .	1 pint.
Yellow Wax, . . . . .	2 ounces.
Turpentine, . . . . .	2 ounces.
Burgundy pitch, . . . . .	1 ounce.

Melt over a slow fire; add a few drams of essential oil of lavender, and rub it into the boots, either in the sun or by the fire.

Another recipe directs us to take half a pound of beeswax, one quarter of a pound of resin, and the like quantity of mutton suet. Boil these together; and if the boots be new, anoint them well with this preparation, lukewarm. For old boots, substitute beef-tallow for mutton-suet.

Chandler's Composition, which is very highly recommended, is prepared thus: One quarter of a pound of gum caoutchouc, with sufficient naphtha, oil of sassafras, seneca, or any other solvent, to completely dissolve it; after this is effected, a pound of tallow and three quarters of a pound of beeswax should be melted together, and, in connection with the dissolved gum, should be kept over a slow fire until they are intimately commingled. When using the preparation, the boots should be slightly wet and warmed: if the mixture is then properly rubbed in, it is almost impossible for the water to penetrate.

But all these recipes are inferior to the waterproofing which is applied by the Porous Waterproof Company,

whose address is 144 and 146 North Fifth Street, Philadelphia. This company uses a process which leaves ordinary garments perfectly open and porous, and yet completely proof against rain and snow. Consequently, while the perspiration and other exhalations are allowed to escape freely, the wearer is kept dry. We have seen common mosquito-netting so prepared by their process that a table-spoonful of water poured into a little bag of the netting would not pass through; and boots prepared in this way have been used during a trouting excursion, and kept for hours in the water without showing any signs of leaking. One of the most valuable features of the process is that it can be applied to boots and garments already made up. So far as the comfort of sportsmen is concerned, we have no hesitation in saying that it is the most valuable invention ever brought before the public.

**Mending Rubber Boots.**—It frequently happens that a slight crack renders a pair of valuable rubber boots entirely worthless; so that the ability to mend such a break would be worth to the owner very nearly the price of a pair of boots. Dealers in rubber goods sell a cement by which it is said that boots may be mended, but it will be found that very few of the uninitiated are able to apply it successfully, and the professionals keep the matter a profound secret. We are assured by a person who has been very successful in mending boots, as we know by experience, that the great secret of success lies in getting the two surfaces that you wish to join, clean and new. Cement will not stick to old, wet, or dirty rubber surfaces. Take a piece of stout sheet-rubber, of a size and shape sufficient to cover the crack; with sand-paper or a sharp knife or razor, make a new clean surface on both the patch and the boot; cover both with cement, press them together firmly, and keep them firmly pressed together; stand them by the fire for twelve hours, and then give them a few days to dry. We are assured that a patch put on in this way will not easily come off or leak.

**Care of the Health.**—While field sports, if properly carried on, have undoubtedly a tendency to improve the health of those who engage in them, it frequently happens that the sportsman, either from ignorance or carelessness, so exposes himself as to be seriously injured. One of the greatest dangers from this exposure is the liability to catch cold, and all the numerous ills—rheumatism, consumption, colic, fevers, etc.—that usually flow from it. The following hints, which we have always found effectual, and which are based on common sense, may perhaps prove useful :—

Little danger need be apprehended from exposure to the most severe weather, provided we are properly prepared for it. Therefore, in the fall and spring always go warmly clad ; and remember that weather which appears to be very pleasant in your own dooryard may be very chilling on the lake, the marsh, the snipe-bog, or the seashore. In fall and spring always go out prepared, as if you expected a rain or snow storm.

If by chance you should be thoroughly wet with a sudden shower, do not sit down even under the cover of the most inviting shelter. If you can get into a barn, where you can walk about briskly while the rain is pouring down, very well ; but you had far better walk about under the heaviest shower than creep under a hedge and lie still with wet clothes. A wetting never hurt any man that kept in exercise while he was wet. Stand still or sit down with wet clothes, and your doom is sealed.

In drinking, when out in warm weather, avoid stagnant water ; and if you are compelled to drink such, it is always well to mix a little good spirits with it. But except for such purposes, never indulge in spirituous or malt liquor when out hunting. Instead, however, of relying on chance supplies of poor water which requires to be qualified with whiskey, we always carry a flask of cold tea, made strong, without milk and with but little sugar. A mouthful of this is more lastingly refreshing than a drink of liquor and water.

Most sportsmen follow the advice given by Watts, and hurry with them

“A pocket pistol, neat and handy,  
Charged with some good old rum or brandy,”

as a precaution against cholera-morbus and similar disorders, induced by accidental exposure. This is very injudicious. Any chemist can put up a much better preparation than any brandy or whiskey you can find. For our own part, we use a preparation with which we have been acquainted for some years, and which we find to be excellent—Campbell’s Cholera Cordial. It may be procured from almost any druggist, and a small bottle is sufficient for any ordinary excursion. It is unquestionably the best article in market for this purpose.

**Preserving Game after it has been Shot.**—The excessively warm weather during which much of our shooting is done in this country, renders it absolutely necessary that some means should be taken to keep the game from being tainted before it is used; for, in the United States we do not admire our game in that “high” condition that is so acceptable to European epicures. In many cases, where a large party takes the field, a quantity of ice is taken along, and in this way the results of several days’ shooting are kept in good condition until wanted. But, besides the fact that ice is cumbrous, and entirely unsuited to the wants of a small party, it is also true that game that is kept long in contact with ice, loses entirely that fine piquant flavor that renders wild animals so much superior to domestic fowls. It becomes sodden and tasteless, unless indeed the excursionists provide themselves with properly constructed refrigerators, which is very improbable.

Where game is to be kept under not very unfavorable conditions, great advantage will be gained by paunching the quadrupeds, and drawing the birds, as well as emptying the crops of the latter. Game treated in this way will remain in sound condition for at least half a day longer than it otherwise would do; and this is a very important matter

where the day is exceedingly warm and sultry, as it enables us to take home at night the proceeds of the morning's shooting,—while, without this precaution, we have over and over again seen birds that had been shot in the morning, thrown away as unusable at night. If the marker or attendant be provided with a sharp knife, it is but a minute's work to remove the crop and entrails from a woodcock or grouse.

A more efficient, though more troublesome process, but at the same time one that is more easily put in practice than carrying ice, is to remove the entrails or the contents of the crop, or both, and fill the vacant space with coarsely powdered charcoal. Almost all game begins to taint in the neighborhood of these parts, because the incipient putrefaction to which the contents of the crop and entrails are liable, extend to the flesh in the immediate neighborhood. The charcoal absorbs all the tainted juices, and keeps the meat in good condition. The charcoal should be carefully selected,—only those pieces being chosen which are well burnt and free from all odor of creosote. If it be desired to keep the charcoal from direct contact with the game, it may be tied up in some thin kind of fabric, such as very loose muslin, though we confess that we have never practised such diletanteism. But by the use of charcoal we have kept birds for a day and a half after others, shot at the same time, had become completely spoiled.

THE END.

Write for large Illustrated Price-List. Address,

J. H. JOHNSTON.

# GREAT WESTERN GUN WORKS.

No. 179 Smithfield Street,

PITTSBURGH, PA.



Breech-Loading Shot-Guns, . . . .	\$40 to 300
Double Shot-Guns, . . . . .	8 to 150.
Single Guns, . . . . .	3 to 20.
Rifles, . . . . .	8 to 75.
Revolvers, . . . . .	6 to 25.
Pistols, . . . . .	1 to 8.

Gun Materials, Fishing-Tackle, &c.

---

*Large Discount to Dealers and Clubs.*

---

Army Guns, Revolvers, &c., bought or traded for. Goods sent by express C.O.D., to be examined before paid for.

# THE YOUNG SCIENTIST,

A Practical Journal for Amateurs.

ISSUED MONTHLY. Price 50 Cents per year.

It is characteristic of young Americans that they want to be doing something. They are not content with merely *knowing* how things are done, or even with *seeing* them done; they want to do them themselves. In other words, they want to experiment. Hence the wonderful demand that has sprung up for small tool chests, turning lathes, scroll saws, wood carving tools, telegraphs, model steam engines, microscopes and all kinds of apparatus. In nine cases out of ten, however, the young workman finds it difficult to learn how to use his tools or apparatus after he has got them. It is true that we have a large number of very excellent text-books, but these are not just the thing. What is wanted is a living teacher. Where a living teacher cannot be found, the next best thing is a live journal, and this we propose to furnish. And in attempting this it is not our intention to confine ourselves to mere practical directions. In these days of knowledge and scientific culture, the "Why" becomes as necessary as the "How." The object of the YOUNG SCIENTIST is to give clear and easily followed directions for performing chemical, mechanical and other operations, as well as simple and accurate explanations of the principles involved in the various mechanical and chemical processes which we shall undertake to describe.

The scope and character of the journal will be better understood from an inspection of a few numbers, or from the list of contents found on a subsequent page, than from any labored description. There are, however, three features to which we would call special attention:

**CORRESPONDENCE.**—In this department we intend to place our readers in communication with each other, and in this way we hope to secure for every one just such aid as may be required for any special work on hand.

**EXCHANGES.**—An exchange column, like that which has been such a marked success in the *Journal of Microscopy*, will be opened in the YOUNG SCIENTIST. Yearly subscribers who may wish to exchange tools, apparatus, books, or the products of their skill, can state what they have to offer and what they want, without charge. Buying and selling must, of course, be carried on in the advertising columns.

**ILLUSTRATIONS.**—The journal will make no claims to the character of a "picture book," but wherever engravings are needed to make the descriptions clear they will be furnished. Some of the engravings which have already appeared in our pages are as fine as anything to be found in the most expensive journals.

## Special Notice.

As our journal is too small and too low-priced to claim the attention of news dealers, we are compelled to rely almost wholly upon subscriptions sent directly to this office. As many persons would no doubt like to examine a few numbers before becoming regular subscribers, we will send four current numbers as a trial trip for

**FIFTEEN CENTS.**

## CLUBS.

Where three or more subscribe together for the journal, we offer the following liberal terms:

3 copies for .....	\$1.25
5 " " .....	2.00
7 " " .....	2.75
10 " " .....	3.50

Advertisements, 30 cents per line.

As postal currency has nearly disappeared from circulation, we receive postage stamps of the lower denominations (ones, twos and threes) at their full value. Postal orders are, however, much safer and more convenient. To avoid delay and mistakes address all communications to "THE YOUNG SCIENTIST, Box 4875, New York," and make all checks and orders payable to John Phin.



Just Published. 1 Vol., 12mo. Neatly Bound in Cloth, Gilt Title. Price 75 cents.

# HOW TO USE THE MICROSCOPE.

A Simple and Practical Book, intended for beginners.

By JOHN PHIN,

*Editor of "The American Journal of Microscopy."*

Second Edition. Greatly Enlarged, with 50 illustrations in the text,  
and 4 full-page engravings printed on heavy tint paper.

## CONTENTS:

**WHAT A MICROSCOPE IS.**—Different Kinds of Microscopes.—Simple Microscopes.—Hand Magnifiers.—The Coddington Lens.—The Stanhope Lens.—Raspail's Microscope.—The Excelsior Microscope.—Twenty-five cent Microscopes and how to make them.—Penny Microscopes.

**COMPOUND MICROSCOPES.**—Different kinds of Objectives.—Non-Achromatic Objectives.—French Achromatic Objectives.—Objectives of the English Form.—Immersion Objectives.—Focal Lengths corresponding to the numbers employed by Nachet, Hartnack and Gundlach.

**HOW TO CHOOSE A MICROSCOPE.**—Microscopes for Special Purposes.—Magnifying Power required for different purposes.—How to judge of the quality of the different parts of the Microscope.

**ACCESSORY APPARATUS.**—Stage Forceps, Animalcule Cage, etc.

**ILLUMINATION.**—Sun Light.—Artificial Light.—Bulls-Eye Condenser.—Side Reflector.—The Lieberkuhn.—Axial Light.—Oblique Light.—Direct Light.

**HOW TO USE THE MICROSCOPE.**—How to Care for the Microscope.

**HOW TO COLLECT OBJECTS.**—Where to find Objects.—What to Look for.—How to Capture Them.—Nets.—Bottle-Holders.—Spoons.—New Form of Collecting Bottle.—Aquaria for Microscopic Objects.—Dipping Tubes.

**THE PREPARATION AND EXAMINATION OF OBJECTS.**—Cutting Thin Sections of Soft Substances.—Sections of Wood and Bone.—Improved Section Cutter.—Sections of Rock.—Knives.—Scissors.—Needles.—Dissecting Pans and Dishes.—Dissecting Microscopes.—Separation of Deposits from Liquids.—Preparing whole Insects.—Feet, Eyes, Tongues, Wings, etc., of Insects.—Use of Chemical Tests.—Liquids for Moistening Objects.—Refractive Power of Liquids.—Covers for Keeping out Dust.—Errors in Microscopical Observations.

**PRESERVATION OF OBJECTS.**—General Principles.—Recipes for Preservative Fluids.—General Rules for Applying them.

**MOUNTING OBJECTS.**—Apparatus and Materials for: Slides, Covers, Cells, Turn-Table, Cards for Making Cells, Hot-Plate, Lamps, Retort Stand, Slide-Holder, Mounting Needles, Cover Forceps, Simple Form of Spring Clip, Centering Cards, Gold Size, Black Japan, Brunswick Black, Shellac, Bell's Cement, Sealing Wax Varnish, Colored Shellac, Damar Cement, Marine Glue, Liquid Glue, Dextrine.—Mounting Transparent Objects Dry.—Mounting in Balsam.—Mounting in Liquids.—Mounting of Whole Insects.—How to Get Rid of Air-Bubbles.—Mounting Opaque Objects.

**FINISHING THE SLIDES.**

May be obtained from any Bookseller or News Agent, or will be sent by mail, postage paid, on receipt of price.

**THE INDUSTRIAL PUBLICATION COMPANY,**

P. O. Box 4875.

176 Broadway, New York.

# GENESIS AND GEOLOGY.

---

The only really scientific and logical system of harmony between Genesis and Geology is to be found in a little work, just published, and entitled

## THE CHEMICAL HISTORY OF The Six Days of Creation.

By JOHN PHIN, C. E., EDITOR OF "THE TECHNOLOGIST."

1 Vol., 12mo., Cloth. 75 cents.

In this work an attempt is made to show that the account given of the Creation, in the first chapter of Genesis, agrees *literally* with the record developed by the investigations of modern science.

May be ordered through any bookseller. Single copies sent by mail, on receipt of price, by

THE INDUSTRIAL PUBLICATION COMPANY,  
P. O. Box 4,875. 176 Broadway, New York.

---

The following are a few of the Opinions of the Press:

This is a small book, but full of matter.—*The Presbyterian* (Philadelphia).

A very candid and ingenious essay.—*Christian Union* (H. W. Beecher's paper).

It is a topic which needs a calm and well-directed intellect to approach, and Mr. Phin has surrounded its discussion with thoughts of the deepest interest to all minds seeking rest on this much perplexing question.—*Journal of the Telegraph*.

The reasons and conclusions are clear, distinct, and natural. The book will interest and instruct, and is intended to lead the reasoning mind to firmer faith in the light of revelation.—*New York Globe*.

No one can read this book without compensation, without becoming more thoughtful concerning the phenomena of creation, and he need lose none of his reverence for the supremacy of the Divine Law.—*Rural New-Yorker*.

*The Only Practical Book Published on this Subject.*

# THE PISTOL

AS A

## WEAPON OF DEFENCE,

In the House and on the Road.

12mo. Cloth. 50 cents.

---

This work aims to instruct the peaceable and law-abiding citizens in the best means of protecting themselves from the attacks of the brutal and the lawless. Its contents are as follows: The Pistol as a Weapon of Defence—The Carrying of Fire-Arms—Different kinds of Pistols in Market; how to Choose a Pistol—Ammunition, different kinds; Powder, Caps, Bullets, Copper Cartridges, etc.—Best form of Bullet—How to Load—Best charge for Pistols—How to regulate the Charge—Care of the Pistol; how to clean it—How to handle and carry the Pistol—How to Learn to Shoot—Practical use of the Pistol; how to Protect yourself and how to Disable your antagonist.

"No man is fit to keep house who is not fit to defend it."—*Henry Ward Beecher.*

"So long as rogues cannot be prevented from carrying weapons, honest men do not consult their own safety and the public good by totally discarding them."—*Recorder Hackett.*

"Such I hold to be the genuine use of gunpowder; that it makes all men alike tall (or strong)."—*Carlyle.*

For Sale by all Newsdealers, or Sent postpaid by Mail on receipt of price

THE INDUSTRIAL PUBLICATION COMPANY,

176 Broadway, New York.

*JUST PUBLISHED, in 1 vol., 12mo., Handsomely Bound  
in Cloth, Gilt Title. Price 50 cents.*

**PLAIN DIRECTIONS**  
FOR  
**The Construction and Erection**  
OF  
**LIGHTNING RODS.**

By JOHN PHIN, C. E.,

Editor of THE TECHNOLOGIST. Author of THE CHEMICAL  
HISTORY OF THE SIX DAYS OF THE CREATION, etc.

**SECOND EDITION. ENLARGED AND FULLY ILLUSTRATED.**

This is a simple and practical little work, intended to convey just such information as will enable every property owner to decide whether or not his buildings are thoroughly protected. It is not written in the interest of any patent or particular article of manufacture, and by following its directions, any ordinarily skilful mechanic can put up a rod that will afford perfect protection, and that will not infringe any patent. Every owner of a house or barn ought to procure a copy.

**May be Ordered through any Bookseller,**  
or will be sent free by mail on receipt of price, by

*The Industrial Publication Co.,*  
Post-Office Box 4,875. 176 Broadway, New York.

 **ANY NEWS COMPANY WILL SUPPLY IT.** 

JUST PUBLISHED, in 1 vol., 12mo., Handsomely Bound in Cloth,  
Gilt Title. Price 75 cents.

---

*A BOOK FOR EVERYBODY.*

---

What to Do

AND

How to Do It

IN CASE OF

**A C C I D E N T.**

---

This is one of the most useful books ever published. It tells exactly WHAT TO DO IN CASE OF ACCIDENTS, such as Severe Cuts, Sprains, Dislocations, Broken Bones, Burns with Fire, Scalds, Burns with Corrosive Chemicals, Sunstroke, Suffocation by Foul Air, Hanging, Drowning, Frost-Bite, Fainting, Stings, Bites, Starvation, Lightning, Poisons, Accidents from Machinery, and from the Falling of Scaffolding, Gunshot Wounds, etc., etc.

It ought to be in every house, for young and old are liable to accident, and the directions given in this little book might be the means of saving many a valuable life.

**May be Ordered through any Bookseller,**  
or will be sent free by mail on receipt of price, by

**THE INDUSTRIAL PUBLICATION COMPANY,**  
**P. O. Box 4,875. 176 Broadway, New York.**

**ANY NEWS COMPANY WILL SUPPLY IT.**

THE  
**AMATEUR'S HANDBOOK**  
OF  
**Practical Information,**  
**FOR THE WORKSHOP AND THE LABORATORY.**

---

This is a handy little book, containing just the information needed by Amateurs in the Workshop and Laboratory.

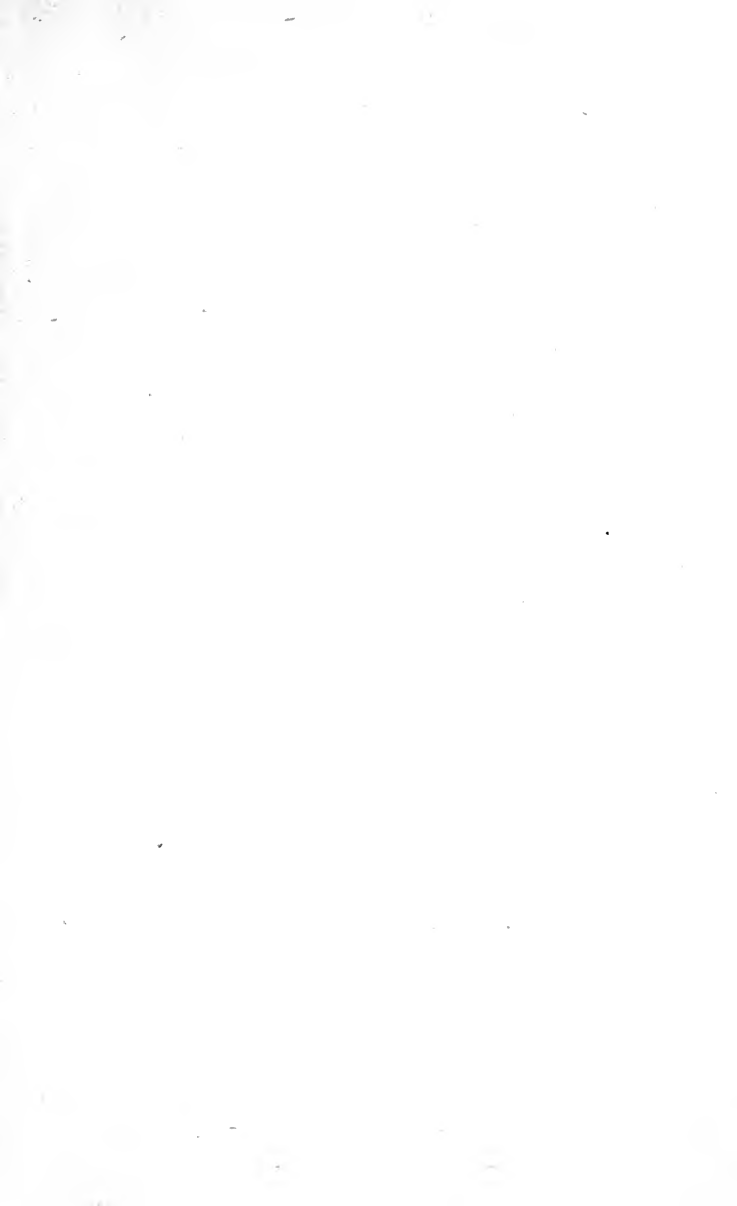
Directions for making Alloys, Fusible Metals, Cements, Glues, etc.; and for Soldering, Brazing, Lacquering, Bronzing, Staining and Polishing Wood, Tempering Tools, Cutting and Working Glass, Varnishing, Silvering, Gilding, Preparing Skins, etc., etc.

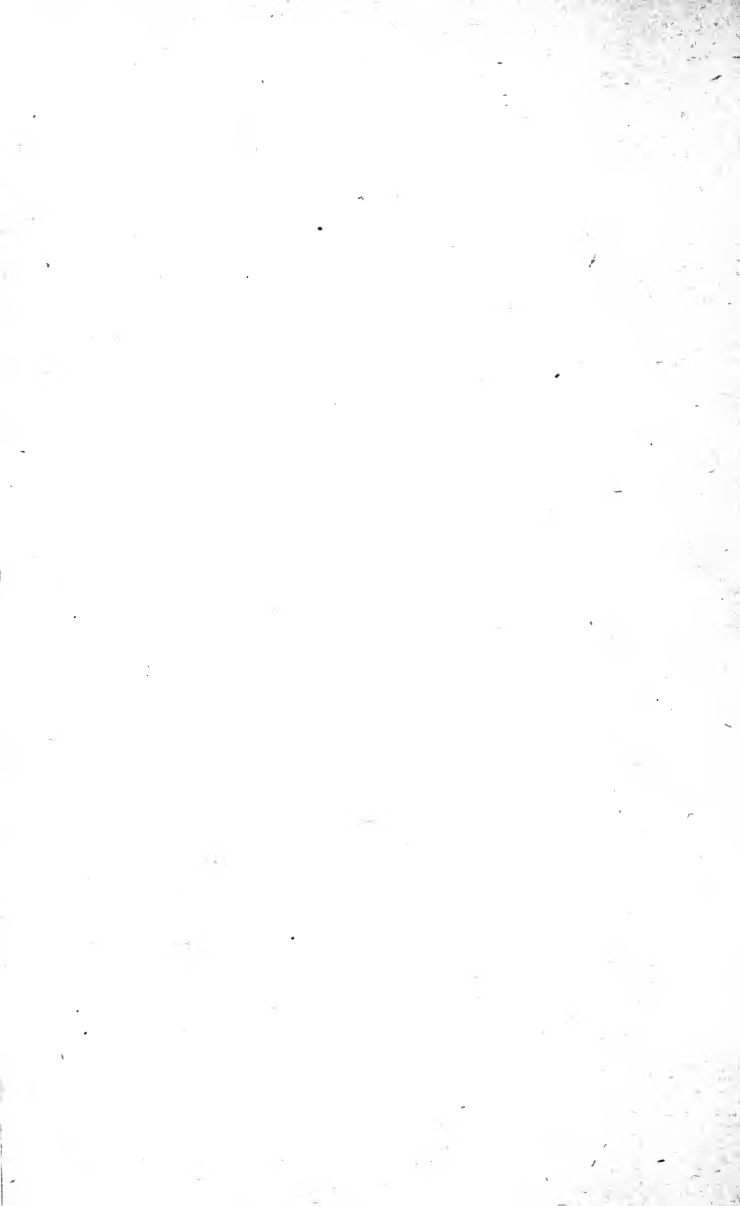
**Neatly Bound. Price 10 cents.**

*Will be sent by Mail to any address on receipt of price.*

**THE INDUSTRIAL PUBLICATION COMPANY,**

**176 Broadway, New York.**









G. E. Tilgner  
March 3<sup>rd</sup> 1907  
Sunday

At 10<sup>th</sup> of April

1907  
Friday

Remnant

YB 10236

**M314083**

